Western Orthopaedic Association

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Western Orthopaedic Association

78th Annual Meeting

July 30–August 2, 2014
The Fairmont Orchid
Big Island, Hawaii

2014
Meeting Program

Chuck Freitag

Executive Director, Data Trace Management Services, a Data Trace Company

Cynthia Lichtefeld

Director of Operations, Data Trace Management Services, a Data Trace Company

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Phone: 866-962-1388 • Fax: 410-494-0515 • Email: info@woa-assn.org

Visit us @ www.woa-assn.org

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

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

The American Academy of Orthopaedic Surgeons is accredited by the ACCME to provide continuing medical education for physicians. The American Academy of Orthopaedic Surgeons designates this live activity for a maximum of 29.5 *AMA PRA Category 1 Credits*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

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President's Message

Valerae O. Lewis, MD

Aloha and Welcome,

I am honored to welcome all of you to the 78th Annual Meeting of the Western Orthopaedic Association. We proudly offer an outstanding academic program in luxurious surroundings at the Fairmont Orchid, along the Kohala Coast on the island of Hawaii. A great educational opportunity in spectacular surroundings! What could be better?

The Program Committee chaired by Drs. Bryan Moon and Melvyn Harrington have put together 29.5 credits of education on timely topics. You will have the opportunity to enjoy 3 days of programming, highlighted by symposia on Instability of the Elbow, Wrist, and Hand in the Athlete; Foot and Ankle; Sports Medicine; Tumor; and Hip and Knee Arthroplasty. A special symposium on the Pitfalls of Orthopaedic Imaging will provide you with a systematic approach on avoiding common interpretation errors in orthopaedic imaging. This year Masters Surgeons will provide you with the opportunity for small group case discussion.

Don't forget to sign up for your Self-Assessment Exams. This is a rare opportunity to fulfill 10 Scored credits in an interactive environment.

The Progam Committee has selected a wide range of high quality original research papers and awards will be given to the top residents and young investigators. As always, there will be scientific posters and multimedia education sessions available throughout the meeting.

We welcome Dr. Walter Willett as the Howard Steel Lecturer. Dr. Willett, bestselling author and Professor and Chair of Nutrition at Harvard Medical School will discuss nutrition with us as it relates to the body's requirements versus industry standards/desires. The Presidential Guest Speaker will be Dr. Dempsey Springfield, who will address and discuss the importance of "the competencies" as they relate to Orthopaedic Surgery. Both lectures are sure to stimulate a lively discussion.

We are honored to have the American Academy of Orthopaedic Surgeons' President Fred Azar, MD. In addition to the AAOS Update, Dr. Azar and colleagues will give us an "Update From Orthopaedic Leadership on Health Policy."

In Hawaii, the opportunities are endless, as one can do practically anything — how about snowboarding in the morning and scuba diving in the afternoon with a great educational meeting in between? Sure, anything is possible in Hawaii. Our meeting starts with a beautiful Welcome Reception on Thursday night, time to socialize at the exhibitor reception, while the kids have movies and arts & crafts, and on Saturday we will celebrate with the Hawaiian tradition of Luau. Stacy Wald has a great social calendar planned for us all! Thank you Stacy and all the Data Trace staff!

Let's have a great meeting — Huli pau!

Sincerely,

Valerae Lewis

Valerae O. Lewis, MD
President, Western Orthopaedic Association

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Meeting-at-a-Glance

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

TUESDAY, JULY 29, 2014

3:40pm–10:30pm	**Mauna Kea Summit** *(Meet in Lobby)*

WEDNESDAY, JULY 30, 2014

12:00pm–4:00pm	**Board of Directors Meeting** *(Plaza 3)*
12:00pm–5:00pm	**Meeting Registration** *(Grand Ballroom Foyer)*
12:00pm–5:00pm	**Exhibit Setup** *(Grand Ballroom Salons 2 & 3)*
12:00pm–5:00pm	**Scientific Poster Setup** *(Grand Ballroom Foyer)*
12:00pm–5:00pm	**Speaker Ready Room** *(Pikake Room)*

THURSDAY, JULY 31, 2014

5:00am–6:00am	**Scientific Poster Session** *(Grand Ballroom Foyer)* Note: Presenters will be available to answer questions.
5:00am–1:30pm	**Speaker Ready Room** *(Pikake Room)*
5:45am–1:30pm	**Meeting Registration** *(Grand Ballroom Foyer)*
5:45am–1:30pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks, and Daily Drawing** *(Grand Ballroom Salons 2 & 3)*
6:00am–1:30pm	**Scientific Sessions and Symposia** *(Grand Ballroom Salon 1)*
6:05am–6:20am	**First Business Meeting** *(Grand Ballroom Salon 1)*
9:00am–10:30am	**Spouse/Children's Hospitality** *(Wailana Garden)*
9:30am–10:10am	**Presidential Guest Speaker** *(Grand Ballroom Salon 1)*
11:20am–12:20pm	**WOA Luncheon Industry Presentations — Cadence Pharmaceuticals, Inc. and Pacira Pharmaceuticals, Inc.** *(Grand Ballroom Salon 1)* *CME Credit Not Available
12:20pm–1:30pm	**Concurrent General Session** *(Plaza 1 & 2)*
12:20pm–1:30pm	**PA Session** *(Plaza 3)*
1:30pm–3:00pm	**Scientific Poster Session** *(Grand Ballroom Foyer)* Note: Presenters will be available to answer questions.
2:00pm–4:00pm	**Shoreline Holoholo (fishing)** *(Meet in Lobby)*
3:00pm–4:00pm	**Petroglyph Hike** *(Meet in Lobby)*
3:00pm–5:00pm	**Multimedia Education Session** *(Pikake Room)*

* See Activities Information on pages 9-10 for more details

4:00pm–5:00pm	**Tide Pool Education** *(Meet in Lobby)*
5:45pm–6:30pm	**New Member and PA Reception** *(Kilohana Room)*
6:30pm–9:30pm	**Welcome Reception** *(Croquet Lawn)*

FRIDAY, AUGUST 1, 2014

5:00am–6:00am	**Scientific Poster Session** *(Grand Ballroom Foyer)* Note: Presenters will be available to answer questions.
5:00am–6:00am	**Regional and AAOS President's Breakfast Meeting with State Presidents and Board of Councilors** *(Paniolo Lounge)*
5:00am–1:30pm	**Speaker Ready Room** *(Pikake Room)*
5:45am–1:30pm	**Meeting Registration** *(Grand Ballroom Foyer)*
5:45am–1:30pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks, and Daily Drawing** (*Grand Ballroom Salons 2 & 3)*
6:00am–12:30pm	**Scientific Sessions and Symposia** *(Grand Ballroom Salon 1)*
7:05am–8:05am	**Concurrent General Session** *(Plaza 1 & 2)*
7:05am–8:05am	**PA Session** *(Plaza 3)*
9:30am–10:20am	**Howard Steel Lecture** *(Grand Ballroom Salon 1)*
11:30pm–12:30pm	**Concurrent General Session** *(Plaza 1 & 2)*
11:30pm–12:30pm	**PA Session** *(Plaza 3)*
1:00pm–5:30pm	**Golf Tournament** *(Meet in Lobby at 12:10pm)*
12:30pm–2:00pm	**Scientific Poster Session** *(Grand Ballroom Foyer)* Note: Presenters will be available to answer questions. Poster award selection during this session.
2:00pm–4:00pm	**Tennis Round Robin** *(Meet at Tennis Courts)*
2:00pm–4:00pm	**Multimedia Education Session** *(Pikake Room)*
5:30pm–7:30pm	**Exhibitor Reception** *(Grand Ballroom Salons 2 & 3)*
5:30pm–7:30pm	**Kid's Movie Night with Arts & Crafts and Dinner** *(Grand Ballroom Salon 1)*

SATURDAY, AUGUST 2, 2014

5:00am–6:00am	**Scientific Poster Session** *(Grand Ballroom Foyer)* Note: Presenters will be available to answer questions.
5:00am–6:00am	**WOA Board Meeting with Breakfast** *(Kilohana Room)*
5:00am–1:00pm	**Speaker Ready Room** *(Pikake Room)*
5:45am–1:00pm	**Meeting Registration** *(Grand Ballroom Foyer)*
5:45am–1:00pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks, and Daily Drawing** (*Grand Ballroom Salons 2 & 3)*

* See Activities Information on pages 9-10 for more details

6:00am–1:00pm	**Scientific Sessions and Symposia** *(Grand Ballroom Salon 1)*
6:50am–7:05am	**Second Business Meeting** *(Grand Ballroom Salon 1)*
10:30am–11:00am	**WOA Presidential Address** *(Grand Ballroom Salon 1)*
12:00pm–1:00pm	**Concurrent General Session** *(Plaza 1 & 2)*
12:00pm–1:00pm	**PA Session** *(Plaza 3)*
12:30pm–5:30pm	**Waterfall Tour** *(Meet in Lobby)*
1:00pm–2:00pm	**Scientific Poster Session** *(Grand Ballroom Foyer)* Note: Presenters will be available to answer questions.
2:00pm–4:00pm	**Multimedia Education Session** *(Pikake Room)*
6:00pm–9:30pm	**Family Luau – "Gathering of the Kings"** *(Turtle Pointe)*

* See Activities Information on pages 9-10 for more details

Scientific Program Agenda

Grand Ballroom Salon 1 (unless otherwise specified)

Presenters and times are subject to change.

THURSDAY, JULY 31, 2014

5:00am–6:00am	**Scientific Poster Session** *(Grand Ballroom Foyer)* Note: Poster Presenters Available
6:05am–6:20am	**First Business Meeting**
6:20am–7:20am	**General Session 1 — Assorted Topics**
7:20am–8:10am	**Symposium 1 — Tumor Update**
8:10am–8:30am	**Break — Please visit Exhibitors and Posters** *(Grand Ballroom Salons 2 & 3)*
8:30am–9:20am	**Symposium 2 — Instability of the Elbow, Wrist, and Hand in the Athlete: A Case Based Approach**
9:20am–10:10am	**General Session 2 — BOC Report and Presidential Guest Speaker**
10:10am–10:30am	**Break — Please visit Exhibitors and Posters** *(Grand Ballroom Salons 2 & 3)*
10:30am–11:20am	**Symposium 3 — Sports Medicine**
11:20am–12:20pm	**WOA Luncheon Industry Presentaions — Cadence Pharmaceuticals, Inc. and Pacira Pharmaceuticals, Inc.** *CME Credit Not Available
12:20pm–1:30pm	**Concurrent Session 3 — Basic Science/Tumor**
12:20pm–1:30pm	**Concurrent Session 4 — Pediatrics** *(Plaza 1 & 2)*
12:20pm–1:30pm	**PA Session 1 — Trauma** *(Plaza 3)*
1:30pm–3:00pm	**Scientific Poster Session** *(Grand Ballroom Foyer)* Note: Poster Presenters Available
3:00pm–5:00pm	**Multimedia Education Session** *(Pikake Room)*

FRIDAY, AUGUST 1, 2014

5:00am–6:00am	**Scientific Poster Sessions** *(Grand Ballroom Foyer)* Note: Poster Presenters Available
6:00am–7:00am	**General Session 5 — Case Reviews**
7:00am–7:05am	Change Rooms
7:05am–8:05am	**Concurrent Session 6 — Sports Medicine**
7:05am–8:05am	**Concurrent Session 7 — Total Hip** *(Plaza 1 & 2)*
7:05am–8:05am	**PA Session 2 — Sports Medicine** *(Plaza 3)*
8:05am–8:25am	**Break — Please visit Exhibitors and Posters** *(Grand Ballroom Salons 2 & 3)*
8:25am–9:15am	**Symposium 4 — Trauma**

9:15am–10:20am	**General Session 8 — AAOS Report and Howard Steel Lecture**
10:20am–10:40am	**Break — Please visit Exhibitors and Posters** *(Grand Ballroom Salons 2 & 3)*
10:40am–11:30am	**Symposium 5 — Health Policy Update from Orthopaedic Leadership**
11:30pm–12:30pm	**Concurrent Session 9 — Trauma**
11:30pm–12:30pm	**Concurrent Session 10 — Upper Extremity 1** *(Plaza 1 & 2)*
11:30pm–12:30pm	**PA Session 3 — Radiology** *(Plaza 3)*
12:30pm–2:00pm	**Scientific Poster Session** *(Grand Ballroom Foyer)* Note: Poster Presenters Available
2:00pm–4:00pm	**Multimedia Education Session** *(Pikake Room)*

SATURDAY, AUGUST 2, 2014

5:00am–6:00am	**Scientific Poster Session** *(Grand Ballroom Foyer)* Note: Poster Presenters Available
6:00am–6:50am	**Symposium 6 — Hot Topics in Hip and Knee Replacement**
6:50am–7:05am	**Second Business Meeting**
7:05am–7:35am	**General Session 11 — Special Lecture**
7:35am–8:25am	**Symposium 7 — Foot and Ankle**
8:25am–8:55am	**General Session 12 — WOA/OREF Young Investigator Awards**
8:55am–9:20am	**Break — Please visit Exhibitors and Posters** *(Grand Ballroom Salons 2 & 3)*
9:20am–10:25am	**General Session 13 — WOA Resident Awards**
10:25am–11:00am	**General Session 14 — OREF and Presidential Address**
11:00am–11:50am	**Symposium 8 — Practice Management/Medical Legal**
11:50am–12:00pm	**Refreshment Break/Change Rooms** *(Grand Ballroom Foyer)*
12:00pm–1:00pm	**Concurrent Session 15 — Total Knee**
12:00pm–1:00pm	**Concurrent Session 16 — Upper Extremity 2** *(Plaza 1 & 2)*
12:00pm–1:00pm	**PA Session 4 — Review PANCE/PANRE/CAQ** *(Plaza 3)*
1:00pm–2:00pm	**Scientific Poster Session** *(Grand Ballroom Foyer)* Note: Poster Presenters Available
2:00pm–4:00pm	**Multimedia Education Session** *(Pikake Room)*

Activities Information

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

TUESDAY, JULY 29, 2014

Mauna Kea Summit

3:40pm–10:30pm *(Meet in Lobby)*

The summit of Mauna Kea is renowned as the world's greatest astronomical observation site and is also one of Hawaii's most sacred cultural sites. Learn about the remarkable evolution and changes the island's natural world has experienced. A dinner stop will be made at a historic ranch outpost. After dinner you'll be taken to the summit top for a sensational sunset. Stand in awe at the top of the world's tallest volcano amidst the largest collection of telescopes on earth and some of the most dramatic scenery you'll ever witness. And then, at a lower elevation, an Interpretive Naturalist will reveal the wonders and world-class clarity of the Hawaiian night skies.

Must be 16 years or older. Not advised for those with respiratory or heart conditions, pregnancy, or in poor health. Scuba divers, please note that summit altitude is over 13,000 feet (4000 meters). Although guests are provided hooded parkas, they should bring a light sweater or jacket and wear long pants and good walking shoes. Sunset and star viewings are subject to weather conditions.

Price: $190 per person (limited to 28 people)

THURSDAY, JULY 31, 2014

Spouse/Children's Hospitality

9:00am–10:30am *(Wailana Garden)*

Spend time with a Hawaiian Cultural Advisor and learn interesting facts about Hawaiian culture and traditions while you enjoy a tropical breakfast in a lovely setting, afterwards learn Hula in the Gardens.

Price: Included in registration fee

WOA Luncheon Industry Presentations — Cadence Pharmaceuticals, Inc. and Pacira Pharmaceuticals, Inc.

11:20am–12:20pm *(Grand Ballroom Salon 1)*

*CME Credit not available

Price: Included in registration fee; lunch is served

Shoreline Holoholo (fishing)

2:00pm–4:00pm *(Meet in Lobby)*

For guests of all ages. If you like fishing, you will enjoy this leisurely holoholo activity. In Hawaii, you never ask if someone is going fishing. The fish may hear you and you will most likely return home empty handed. Instead, we always say "holoholo," which means, "I'm just going out – here and there." Go holoholo with our Beach Boys to their favorite spot on the shoreline. Bamboo poles, line, tackle, bait, and bottled water provided for all attendees.

Price: $30 per person (minimum 5 people)

Petroglyph Hike

3:00pm–4:00pm *(Meet in Lobby)*

Exclusive WOA afternoon hike to the Puako Petroglyphs, just a short walk from the hotel for our Na Mea Waiwai O Milokukahi (Treasures of Milokukahi).

Price: $10 per person (minimum 15 people)

Tide Pool Education

4:00pm –5:00pm *(Meet in Lobby)*

Exclusive WOA afternoon to the Kalahuipua'a Fishponds. Discover the ocean's natural sanctuary to find an abundance of sea life. Water shoes, hat and sunscreen recommended.

Price: $10 per person (minimum 15 people)

New Member and PA Reception

5:45pm–6:30pm *(Kilohana Room)*

All WOA new members and PAs are invited to attend.

Price: Included in registration fee

Welcome Reception

6:30pm–9:30pm *(Croquet Lawn)*

Have a wonderful evening overlooking the ocean and enjoying the Hawaiian breezes. You'll savor delicious food delicacies and open bar while chatting with friends and colleagues. Take pleasure in the Hawaiian entertainment and soak in the "Big Island" experience.
Attire: Resort Casual (no coat required)

Price: Included in registration fee

FRIDAY, AUGUST 1, 2014

Regional and AAOS President's Breakfast Meeting with State Presidents and Board of Councilors

5:00am–6:00am *(Paniolo Lounge)*

Golf Tournament

1:00pm–5:30pm *(Meet in Lobby at 12:10pm)*

The Mauna Lani Resort South Course snakes through the stark, rugged a'a lava of the prehistoric Kaniku lava flow and offers a panorama of mountain and ocean views. The South Course is also home to No. 15, one of the most photographed over-the-water golf course holes in the world. The tournament will be a shotgun start with a scramble format. Transportation, green fees, lunch and beverage cart included.

Price: $185 per person

Tennis Round Robin

2:00pm–4:00pm *(Meet at Tennis Courts)*

Price: $35 per person

Exhibitor Reception

5:30pm–7:30pm *(Grand Ballroom Salons 2-3)*

Before you go to dinner, start your evening off with drinks and hors d'oeuvres with WOA.

Price: Included in registration fee or $75 per unregistered adult guest

Kid's Movie Night with Arts & Crafts and Dinner

5:30pm–7:30pm *(Plaza 1 & 2)*

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

Price: Included in registration fee or $25 per unregistered child (5-17)

SATURDAY, AUGUST 2, 2014

Waterfall Tour

12:30pm–5:30pm *(Meet in Lobby)*

For an all-around Hawaiian adventure, come experience the heart of the Kohala countryside. North Kohala is a land of old sugar plantations, Hawaiian legends and natural beauty. The excursion begins with a scenic drive through the Kohala countryside, including a four-wheel drive adventure to the trailhead. The loop trail offers two streams with seven waterfalls and three bridges, plus ancient Hawaiian terraces and flumes along the famous Kohala Ditch. With easy walking, countryside views, and a chance for a quick dip in a mountain stream with cascading falls overhead, this adventure is an ideal family day. Must bring a towel and wear closed toed shoes. Involves a 1 mile walk.

Price: $185 per person, lunch included (minimum 12 people)

Family Luau — "Gathering of the Kings"

6:00pm–9:30pm *(Turtle Pointe)*

Just another Luau? Think again! A Polynesian blend of traditional and modern choreography, music and performance built around a feast fit for the ali'i (royalty). Island Breeze Productions and The Fairmont Orchid, Hawaii partner to bring the story of the settlement of Samoa, Tahiti, Aotearoa (New Zealand) and Hawaii to you with "islands" of food representing these islands before the performance. Beginning in a time when the vast, open ocean was yet unchartered, discover how brave people whose descendants would be called Polynesians, carved a path through this ocean thoroughfare to settle on one of the most colorful and lively group of islands in the world. Displayed in its fullness is the mana (power) of the ali'I (chiefs) that would be linked to the one star that guided them, the star of gladness, we call Hokule'a. The "Gathering of the Kings" calls to all mankind, to follow and fulfill their destiny, to bring peace and unity to all.

Attire: Resort Casual (no coat required)

Price: Included in registration fee or $150 per unregistered adult guest or $50 per unregistered child (5-17)

Meeting Information

FORMAT

The educational sessions will be held Thursday, Friday, and Saturday, July 31 – August 2, 2014, from approximately 6:00am until 2:00pm, at The Fairmont Orchid in the Big Island, Hawaii.

TARGET AUDIENCE

The 78th Annual Meeting of the Western Orthopaedic Association has been developed primarily for orthopaedic and trauma surgeons and allied health professionals with a practice profile that is exclusively musculoskeletal.

SPEAKER READY ROOM

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

BADGES/WRIST BANDS

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

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.

CME ACCREDITATION

The American Academy of Orthopaedic Surgeons designates this live activity for a maximum of 29.5 *AMA PRA Category 1 Credits*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

* 16.5 CME credits for Scientific Program
* 7 CME credits for Scientific Poster Sessions
* 6 CME credits for Multimedia Education Sessions

To ensure correct CME credit is awarded, please complete the form in the back of this program, indicating the Sessions you attended or go online to www.woa-assn.org to complete the WOA 2014 Annual Meeting CME Credit Records. CME Certificates will be awarded to all registered participants.

PHYSICIAN REGISTRATION FEE

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

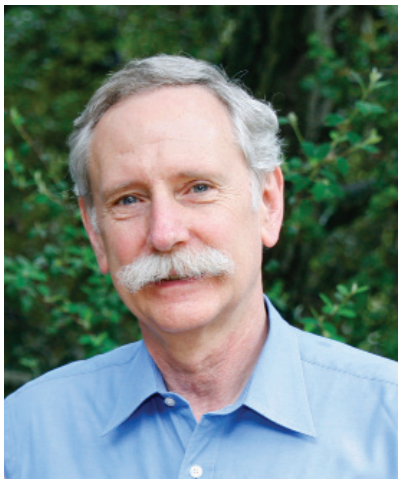
MANAGEMENT

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

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

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

2014 Howard Steel Orthopaedic Foundation Lecturer



Walter Willett, MD, PhD

WOA is pleased to have Dr. Walter Willett, a physician and nutrition researcher as its Howard Steel Lecturer for the 78th Annual Meeting. Currently, Dr. Willett is Professor of Epidemiology and Nutrition and Chairman of the Department of Nutrition at Harvard School of Public Health and Professor of Medicine at Harvard Medical School.

Dr. Willett was born in Hart, Michigan and grew up in Madison, Wisconsin, studied food science at Michigan State University, and graduated from the University of Michigan Medical School before obtaining a Doctorate in Public Health from Harvard School of Public Health. Dr. Willett has focused much of his work over the last 30 years on the development of methods, using both questionnaire and biochemical approaches, to study the effects of diet on the occurrence of major diseases. He has applied these methods starting in 1980 in the Nurses' Health Studies I and II and the Health Professionals Follow-up Study. Together, these cohorts that include nearly 300,000 men and women with repeated dietary assessments are providing the most detailed information on the long-term health consequences of food choices.

Dr. Willett has published over 1,500 articles, primarily on lifestyle risk factors for heart disease and cancer, and has written the textbook, *Nutritional Epidemiology*, published by Oxford University Press. He also has three books for the general public, *Eat, Drink and Be Healthy: The Harvard Medical School Guide to Healthy Eating*, which has appeared on most major bestseller lists, *Eat, Drink, and Weigh Less*, co-authored with Mollie Katzen, and most recently, *The Fertility Diet*, co-authored with Jorge Chavarro and Pat Skerrett. Dr. Willett is the most cited nutritionist internationally, and is among the five most cited persons in all fields of clinical science. He is a member of the Institute of Medicine of the National Academy of Sciences and the recipient of many national and international awards for his research.

2014 President

Valerae O. Lewis, MD

Houston, Texas

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
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WOA First Business Meetings

Western Orthopaedic Association

Grand Ballroom Salon 1
The Fairmont Orchid
Big Island, Hawaii

Thursday, July 31, 2014
Valerae O. Lewis, MD, President, Presiding

AGENDA

I. Call to Order

II. Report of the President, Valerae O. Lewis, MD

III. Report of the Secretary, Brian A. Jewett, MD

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

V. Report of the Membership Committee, Cynthia M. Kelly, MD
(Includes list of New Members)

VI. Report of the 2014 Nominating Committee and Proposed Slate of Officers for 2014-2015, Ellen M. Raney, MD

VII. Election of the 2014-2015 Nominating Committee

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

2013-2014 - Ineligibles

Ellen M. Raney, MD, *Chair*
Kevin L. Smith, MD
Lisa A. Taitsman, MD
Blair C. Filler, MD
Richard J. Haynes, MD
William C. McMaster, MD
Robert R. Slater Jr., MD

2014-2015 Committee

Valerae O. Lewis, MD, *Chair*
Michael R. Dayton, MD
Payam Tabrizi, MD
Jeffrey M. Nakano, MD
1. Nominee
2. Nominee
3. Nominee

VIII. Old Business

IX. New Business

X. Announcements

XI. Adjournment

Minutes of the 2013 First Business Meeting of the Western Orthopaedic Association

Alpine Ballroom
The Resort at Squaw Creek, Lake Tahoe, California
Thursday, August 1, 2013

Ellen M. Raney, MD, President, presiding

CALL TO ORDER AND REPORT OF THE PRESIDENT

Dr. Raney called the meeting to order at 7:00 am. She welcomed everyone to the meeting and thanked Steve Morgan for his efforts on the Scientific Program and Nitin Bhatia for his work on the SAEs. Dr. Raney stated that there are 280 attendees registered for the meeting and 44 exhibitors.

REPORT OF THE SECRETARY

Dr. Raney referred everyone to pages 24 and 26 in the Meeting Program for the 2012 Minutes of the First and Second Business Meetings and asked for approval.

ACTION: It was moved and seconded that the Minutes for the 2012 First and Second Business Meetings be approved. The motion carried.

REPORT OF THE TREASURER/HISTORIAN

Dr. Nakano presented the Treasurer's Report. He reviewed the income statement and balance sheet and reported that WOA is projecting a $101,000 profit. He addressed the loss of membership revenue and stated that the Annual Meeting had good support from industry sponsors. He concluded that the WOA is in a very solid financial position. Dr. Nakano also reviewed the members that had passed away since last year and had a moment of silence in their honor.

REPORT OF THE MEMBERSHIP COMMITTEE

Dr. Kelly reported on membership for WOA. She reviewed the numbers for membership and indicated that membership is down. She stated that the Board is dealing with recruiting new members into the Association and putting some programs into place to draw new members into the WOA.

REPORT OF THE BYLAWS COMMITTEE

Dr. Lawrence Housman, Bylaws Committee Chair, presented the recommended Bylaws changes to the membership. He indicated the Bylaws changes had been distributed in the last WOA newsletter and reviewed the changes to be voted on by the membership.

ACTION: It was moved and seconded that the Bylaws changes be approved as presented. The motion carried

REPORT OF THE 2013 NOMINATING COMMITTEE

Dr. Mandell thanked the 2013 Nominating Committee for their efforts and presented the proposed Slate of Officers for 2013-2014.

President:	Valerae O. Lewis, MD
First Vice-President:	Paul C. Collins, MD
Second Vice President:	William L. Maloney III, MD
Secretary:	Brian A. Jewett, MD
Secretary-Elect:	David D. Teuscher, MD
Treasurer:	Jeffery M. Nakano, MD
Members at Large:	Patrick J. Halpin, MD
	Nitin N. Bhatia, MD
Junior Board Members:	Basil Besh, MD
	Jennifer M. van Warmerdam, MD
Membership Committee:	Jeffrey E. Krygier, MD

ACTION: It was moved by Dr. Filler and seconded by Dr. Haynes to close the nominations for the 2014 Slate of Officers. The motion carried.

Dr. Mandell asked for nominations for next year's Nominating Committee. Four members were nominated from the floor to serve on the 2014 Nominating Committee.
Dr. Blair Filler
Dr. Dick Haynes
Dr. William McMaster
Dr. Robert Slater

ACTION: It was moved and seconded to close the nominations for the 2014 Nominating Committee. The motion carried.

ANNOUNCEMENTS

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

ADJOURNMENT

There being no further business to discuss, Dr. Raney adjourned the meeting at 7:11 am.

WOA Second Business Meetings

Western Orthopaedic Association

Grand Ballroom Salon 1
The Fairmont Orchid
Big Island, Hawaii

Saturday, August 2, 2014
Valerae O. Lewis, MD, President, Presiding

AGENDA

I. Call to Order
II. Presentation of the Proposed Slate of Officers for 2014-2015, Ellen M. Raney, MD
III. Election of Officers, Valerae O. Lewis, MD
IV. Old Business
V. New Business
VI. Announcements
VII. Installation of 2014-2015 President, Paul C. Collins, MD by Valerae O. Lewis, MD
VIII. Adjournment

Minutes of the 2013 Second Business Meeting of the Western Orthopaedic Association

Alpine Ballroom
The Resort at Squaw Creek, Lake Tahoe, California
Saturday, August 3, 2013

Ellen M. Raney, MD, President, presiding

CALL TO ORDER

Dr. Raney called the meeting to order at 7:00 am. She thanked Steve Morgan for doing a terrific job on the Scientific Program.

ELECTION OF OFFICERS

Dr. Peter Mandell presented the proposed Slate of Officers for 2013-2014.

President:	Valerae O. Lewis, MD
First Vice-President:	Paul C. Collins, MD
Second Vice President:	William L. Maloney III, MD
Secretary:	Brian A. Jewett, MD
Secretary-Elect:	David D Teuscher, MD
Treasurer:	Jeffery M Nakano, MD
Members at Large:	Patrick J. Halpin, MD
	Nitin N. Bhatia, MD
Junior Board	Basil Besh, MD
Members:	Jennifer Marie van Warmerdam, MD
Membership Committee:	Jeffrey E. Krygier, MD

ACTION: It was moved and seconded to approve the Slate of Officers for 2013-2014 as presented. The motion carried.

ADJOURNMENT

Dr. Raney stated that the installation of Dr. Valerae Lewis will be postponed to the Gala this evening, which will start at 6:30 pm. She encouraged everyone to visit the exhibitors at the break and to complete the survey that was distributed and hand them in at the back of the room. With no further business to be addressed, the meeting adjourned at 7:13 am.

Western Orthopaedic Association

Scientific Program

July 31-August 2, 2014

The Fairmont Orchid
Big Island, Hawaii

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

2014 Program Co-Chairs

Melvyn A. Harrington Jr., MD
Houston, Texas

Bryan S. Moon, MD
Houston, Texas

WOA Past Program Chairs

1940	Wilbur C. Cox, MD	San Francisco, CA
1941	Harold E. Crowe, MD	Los Angeles, CA
1942	Delbert Hand, MD	San Francisco, CA
1943	UNKNOWN	
1944 – 1946	INACTIVE: WORLD WAR II	
1947	Alfred E. Gallant, MD	Los Angeles, CA
1948	Keene O. Haldeman, MD	San Francisco, CA
1949	Vernon P. Thompson, MD	Los Angeles, CA
1950	Eldon G. Chuinard, MD	Portland, OR
1951	Leonard Barnard, MD	Oakland, CA
1952	J. Vernon Luck, MD	Los Angeles, CA
1953	Ernest M. Burgess, MD	Seattle, WA
1954	Francis J. Cox, MD	San Francisco, CA
1955	Ivar J. Larsen, MD	Honolulu, CA
1956	John R. Schwartzmann, MD	Tucson, AZ
1957	Howard A. Mendelsohn, MD	Beverly Hills, CA
1958	Donald E. Moore, MD	Portland, OR
1959	Harry C. Hughes, MD	Denver, CO
1960	R. G. Lambert, MD	San Diego, CA
1961	Robert A. Murray, MD	Temple, TX
1962	Verne T. Inman, MD	San Francisco, CA
1963	Ernest M. Burgess, MD	Seattle, WA
1964	Homer C. Pheasant, MD	Los Angeles, CA
1965	Paul A. Pemberton, MD	Salt Lake City, UT
1966	Thomas H. Taber Jr., MD	Phoenix, AZ
1967	Lawrence H. Gordon, MD	Honolulu, HI
1968	John J. Niebauer, MD	San Francisco, CA
1969	William H. Keener, MD	Denver, CO
1970	Rodney K. Beals, MD	Denver, CO
1971	Leon L. Wiltse, MD	Long Beach, CA
1972	Michael M. Donovan, MD	Houston, TX
1973	Philip H. Dickinson, MD	San Diego, CA
1974	Donald A. Jones, MD	Honolulu, HI
1975	Taylor K. Smith, MD	Oakland, CA
1976	C. Harold Willingham, MD	Tucson, AZ
1977	William E. Gamble, MD	Denver, CO
1978	St. Elmo Newton III, MD	Seattle, WA
1979	Marvin H. Meyers, MD	Los Angeles, CA
1980	Donald A. Jones, MD	Honolulu, HI
1981	John A. Neufeld, MD	Portland, OR
1982	Robert S. Turner, MD	Albuquerque, NM
1983	Harold K. Dunn, MD	Salt Lake City, UT
1984	William C. McDade, MD	San Diego, CA
1985	John A. Murray, MD	Houston, TX
1986	W. Dilworth Cannon Jr., MD	San Francisco, CA
1987	Jerome D. Wiedel, MD	Denver, CO
1988	Thomas B. Grollman, MD	Honolulu, HI
1989	William C. McMaster, MD	Orange, CA
1990	James D. Heckman, MD	San Antonio, TX
1991	Lawrence R. Housman, MD	Tucson, AZ
1992	Daniel R. Benson, MD	Sacramento, CA
1993	Charles A. Peterson, MD	Seattle, WA
1994	Saul M. Bernstein, MD	Van Nuys, CA
1995	Thomas A. DeCoster, MD	Albuquerque, NM
1996	Morris Mitsunaga, MD	Honolulu, HI
1997	Paul C. Collins, MD	Boise, ID
1998	Robert Hunter, MD	Aspen, CO
1999	Richard Coutts, MD	San Diego, CA
2000	Christopher Beauchamp, MD	Scottsdale, AZ
2001	William A. McGann, MD	San Francisco, CA
2002	Gerard L. Glancy, MD	Denver, CO
2003	Linda J. Rasmussen, MD	Honolulu, HI
2004	Thomas Schmalzried, MD	Los Angeles, CA
2005	Robert R. Slater Jr., MD	Roseville, CA
2006	James B. Benjamin, MD	Tucson, AZ
2007	Jeffrey M. Nakano, MD	Grand Junction, CO
2008	Valerae O. Lewis, MD	Houston, TX
2009	Stuart K. Wakatsuki, MD	Kailua, HI
2010	Nitin N. Bhatia, MD, FACS	Orange, CA
2011	Michael P. Dohm, MD	Grand Junction, CO
	James P. Duffey, MD	Colorado Springs, CO
2012	Brian A. Jewett, MD	Eugene, OR
2013	Steven J. Morgan, MD, FACS	Englewood, CO

2014 Program Committee

Co-Chairs

Melvyn A. Harrington Jr., MD
Houston, Texas

Melvyn A. Harrington Jr., MD is Associate Professor and Residency Program Director in the Department of Orthopedic Surgery at the Baylor College of Medicine. He is a board-certified orthopaedic surgeon, who specializes in arthritis and total joint reconstruction.

Dr. Harrington's professional memberships include the American Academy of Orthopaedic Surgeons, J. Robert Gladden Orthopaedic Society – presidential line, American Association of Hip and Knee Surgeons – alternate member to PCPI, Western Orthopaedic Association – Board Of Directors, Texas Orthopaedic Association, American Medical Association, National Medical Association, the Houston Medical Forum, Arthritis Foundation – Houston Board of Directors, and Movement is Life – National Caucus on Musculoskeletal Health Disparities steering committee.

Bryan S. Moon, MD
Houston, Texas

Bryan S. Moon, MD graduated from Florida State University and received his medical degree from The University of Florida. He then completed his residency training at the University of Missouri – Kansas City and followed that with a fellowship in Musculoskeletal Oncology at the University of Florida.

Dr. Moon began his career at the Greenville Hospital System in Greenville, SC, where he started the orthopaedic oncology program and served as Director of Orthopaedic Oncology. He currently is an Associate Professor, and Co-Director of Fellowship program at MD Anderson Cancer Center in Houston, TX. His clinical interests include sarcoma resection, limb salvage surgery and skeletal metastases.

Dr. Moon is an active member of WOA, AAOS, SOA and MSTS. He is married to his wife Melissa and they have 3 children, Bryan Jr. 18, McKenzie 14 and Elisabeth 12.

Members

Steven J. Morgan, MD, FACS
Englewood, Colorado

Payam Tabrizi, MD
San Jose, California

2014 Presidential Guest Speaker

Dempsey S. Springfield, MD

Boston, Massachusetts

WOA Past Guest Speakers

1954	Jack W. Wickstrom, MD	New Orleans, LA
1955	Paul R. Lipscomb, MD	Davis, CA
1956	Carroll B. Larson, MD	Iowa City, IA
1957	John Saunders, MD	San Francisco, CA
	Rutherford S. Gilfillan, MD	San Francisco, CA
1961	George Eggers, MD	Galveston, TX
1964	D. L. Griffiths, FRCS	Manchester, England
1965	Don H. O'Donoghue, MD	Oklahoma City, OK
1966	George J. Garceau, MD	Indianapolis, IN
1967	H. Relton McCarroll, MD	St. Louis, MO
1968	William T. Green, MD	Boston, MA
1969	Leonard F. Peltier, MD	Tuscon, AZ
1970	James W. Harkess, MD	Louisville, KY
1971	Peter F. Williams, FRCS	Parkville, Australia
	O. Ross Nicholson, FRCS, FRACS	Auckland, New Zealand
1972	James A. Nicholas, MD	New York, NY
	Joseph A. Boyes, MD	Los Angeles, CA
1973	Lowell Peterson, MD	Rochester, MN
	Charles J. Sedgewick, DVM	San Diego, CA
1974	Gerald S. Laros, MD	Chicago, IL
1975	J. William Fielding, MD	New York, NY
1976	W. Robert Harris, MD	Toronto, Canada
1977	Federico Labbe, MD	Guatemala City, Guatemala
	Thomas E. Whitesides Jr., MD	Atlanta, GA
1978	Edward H. Simmons, MD	Toronto, Canada
1979	Ejnar Eriksson, MD	Stockholm, Sweden
1980	Ralph B. Cloward, MD	Honolulu, HI
	Cheng Hsu-His, MD	Beijing, China
1981	Wayne O. Southwick, MD	New Haven, CT
	Stanley W. Jacob, MD	Portland, OR
1982	Henry J. Mankin, MD	Boston, MA
	Richard J. Smith, MD	Boston, MA
1983	M. Freeman, MD, FRCS	London, England
	Stephen C. Jacobsen, PhD	Salt Lake City, UT
1984	Henry W. Apfelbach, MD	Lake Forest, IL
	William H. Harris, MD	Boston, MA
1985	C. McCollister Evarts, MD	Rochester, NY
	Harlan J. Spjut, MD	Houston, TX
1986	William R. Murray, MD	San Francisco, CA
	Clement B. Sledge, MD	Boston, MA
1987	Rocco A. Calandruccio, MD	Memphis, TN
	Maj. Gen. Maurice C. Padden, USAF	Colorado Springs, CO
1988	Quinn H. Becker, MD	Thurmont, MD
	Wu Shou-Yi, MD	Shanghai, Peoples Republic of China
1989	David L. Hamblen, PhD, FRCS	Glasgow, Scotland
	Hon. Justice Burton B. Roberts	Bronx, NY
1990	Benjamin E. Bierbaum, MD	Boston, MA
	Thomas Taylor, FRCS	Sydney, Australia
1991	Professor René K. Marti	Amsterdam, The Netherlands
1992	Ian D. Learmonth, FRCS	Cape Town, South Africa
1993	Christian Gerber, MD	Fribourg, Switzerland
1994	Ian G. Kelly, BSc, MD, FRCS	Glasgow, Scotland
1995	O. Ross Nicholson, FRCS	Auckland, New Zealand
1996	John Leong	Hong Kong, China
	M. Mark Hoffer, MD	Los Angeles, CA
1997	Anthony Pohl	Adelaide, Australia
	Harold K. Dunn, MD	Salt Lake City, UT
1998	Lars Engebretsen, MD	Oslo, Norway
1999	Donald Howie, MBBS	Adelaide, Australia
2000	Lennart Hovelius, MD	Gavle, Sweden
2001	Chitranjan S. Ranawat, MD	New York, NY
2002	Klaus Parsch, MD	Stuttgart, Germany
2003	Charles A. Rockwood Jr., MD	San Antonio, TX
2004	Joseph A. Buckwalter, MD	Iowa City, IA
2005	Robert H. Cofield, MD	Rochester, MN
2006	Marvin Tile, MD, BSc (Med), FRCS(C)	Toronto, Canada
2007	Robert E. Eilert, MD	Denver, CO
2008	Douglas W. Jackson, MD	Long Beach, CA
2009	Frederick A. Matsen III, MD	Seattle, WA
2010	James D. Heckman, MD	Needham, MA
2011	G. Paul DeRose, MD	Durham, NC
2012	Kevin J. Bozic, MD, MBA	San Francisco, CA
2013	Augustus A. White III, MD, PhD	Cambridge, MA

2014 Presidential Guest Speaker

Dempsey S. Springfield, MD

WOA is pleased to welcome Dr. Dempsey S. Springfield as the Presidential Guest Speaker at the 78th Annual Meeting on the Big Island. Dr. Springfield retired from clinical practice in February 2014 after practicing orthopaedic oncology from 1978 to 2014.

He was on the orthopaedic faculty at the University of Florida, Harvard, and the Mount Sinai Medical Center during his career. From the onset of his career he was involved with medical student education and orthopaedic resident education. He was the orthopaedic residency Program Director from 1981 until 1986 at the University of Florida. He became an oral examiner for the American Board of Orthopaedic Surgery in 1983.

Dr. Springfield was a site visitor for the ACGME's Orthopaedic RRC from 1996 to 2002. He was a member of the ACGME's Orthopaedic RRC committee from 2002 to 2008. He was the Chair and Program Director of the orthopaedic residency at Mount Sinai Medical School in New York City from 1996 to 2005. He was the Program Director for the Harvard Combined Orthopaedic Residency from January 2009 to April 2012 and an Associate GME Director for Partners Healthcare from October 2008 to February 2014.

2014 WOA Award Winners

WOA Resident Award Recipients

Congratulations to the following WOA Resident/Fellow Award Recipients. The award papers will be presented during the Scientific Program on Saturday at 9:20am–10:25am.

Seth H. Criner, DO
Immediate Weight Bearing as Tolerated After Locked Plating of Fragility Fractures of the Femur

Joseph W. Galvin, DO
Infection Rate of Intramedullary Nailing Following Temporizing External Fixation in Closed Fractures of the Femoral Diaphysis

Michael Githens, MD
Local Versus Distal Transplantation of Human Neural Stem Cells Following Chronic Spinal Cord Injury

Megan Kuba, MD
One Brace, One Visit: Treatment of Distal Radius Buckle Fractures in Children with a Removable Wrist Brace and No Follow-Up Visit

Natalie L. Leong, MD
In Vivo Evaluation of Electrospun Polymer Grafts for ACL Tissue Engineering

Jared Niska, MD
Controlled Release of Vancomycin and Tigecycline from an Orthopaedic Implant Coating Prevents Staphylococcus Aureus Infection in an Open Fracture Animal Model

Duy Phan, MD
Do Patients with Income-Based Insurance Have Access to Total Joint Arthroplasty?

WOA/OREF Young Investigator Award Recipients

Congratulations to the following WOA/OREF Young Investigator Award Recipients. The award papers will be presented during the Scientific Program on Saturday at 8:25am–8:55am.

Julius A. Bishop, MD
Conventional Versus Virtual Radiographs of the Injured Pelvis and Acetabulum

Reza Firoozabadi, MD, MA
Risk of Spermatic Cord Injury During Anterior Pelvic Ring and Acetabular Surgery: An Anatomical Study

Ran Schwarzkopf, MD, MSc
Patients' Willingness to Contribute to Cost of Novel Implants in Total Joint Arthroplasty

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

Financial Disclosure Information

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

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

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

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

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

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

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

n. No conflicts to disclose.

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

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Asim Ahmad, BSc *(n.)*
Christopher Ahmad, MD *(n.)*
Zahab S. Ahsan, BS *(n.)*
Todd Alamin, MD *(1. Medtronics; 3b. Simpirica, Synthes Spine; 4. Simpirica; 5. Stryker, Medtronics)*
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Laurel Donnell-Fink, MPH *(n.)*
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Thomas R. Hunt III, MD *(1. Tornier; 4. Tornier; 7. Wolters Kluwer Health-Lippincott Williams & Wilkins; 9. AAOS, AOSSM, AAHS)*
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Accreditation Information for the Scientific Program

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

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MISSION

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

PURPOSE

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

OBJECTIVES

Educational objectives in Basic Science, Pediatrics, Total Joint Arthroplasty, Foot and Ankle, Spine, Trauma, Infection, Sports Medicine, Tumors, and Upper Extremity areas will be addressed through a combination of general scientific sessions and symposia offering discussions, guest lectures and paper presentations. After reviewing the needs assessment and the 2013 program evaluation, the Program Committee of the WOA has created a program for 2014 that will afford orthopaedic physicians the opportunity to:

1. Discuss the current trends in Total Hip Arthroplasty;
2. Discuss the current trends in Total Knee Arthroplasty;
3. Discuss update in arthroplasty health policy;
4. Describe and employ in your practice tips and tricks for common orthopaedic traumatic conditions that make fracture reduction and fixation easier for the General Orthopaedist;
5. Discuss current trends in hand and upper extremity conditions;
6. To have an exchange of ideas between the presenters, the faculty and the participants through paper presentations, guest lectureships, symposia, multimedia educational sessions, case presentations and poster exhibits;
7. Discuss the current trends in the management of musculoskeletal tumors.

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 31-August 2. Please plan to visit the Scientific Posters.

MULTIMEDIA EDUCATION

Multimedia education materials will be offered on Thursday, Friday, and Saturday, July 31-August 2. 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 29.5 *AMA PRA Category 1 Credits*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

* 16.5 CME credits for Scientific Program
* 7 CME credits for Scientific Poster Sessions
* 6 CME credits for Multimedia Education Sessions

To ensure correct CME credit is awarded, please complete the form in the back of this program, indicating the Sessions you attended or go online to www.woa-assn.org to complete the WOA 2014 Annual Meeting CME Credit Records. CME Certificates will be awarded to all registered participants.

CEC CREDIT

Physicians Assistants can receive up to 29.5 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.)

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

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

DISCLAIMER

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

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

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

FDA STATEMENT

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

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

2014 Scientific Program

Thursday, July 31, 2014

Grand Ballroom Salon 1 (unless otherwise specified)
(Presenters and times are subject to change.)
Disclosure Information is listed on pages 33-39.

5:00am–6:00am **Scientific Poster Session**
(Grand Ballroom Foyer)
Note: Presenters will be available to answer questions

6:00am–6:05am **Welcome**
Bryan S. Moon, MD, Program Co-Chair
Melvyn A. Harrington Jr., MD, Program Co-Chair
Valerae O. Lewis, MD, President

6:05am–6:20am **First Business Meeting**

General Session 1 — Assorted Topics

Moderators: Richard L. Beaver, MD
Justin Bird, MD

6:20am–6:26am Gravity Versus Manual External Stress View in Evaluating Ankle Stability
Thu-Ba Leba, MD, The University of Texas Medical Branch, Galveston, TX

6:26am–6:32am Medial Malleolus Fleck Sign
Kenneth Nwosu, MD, Harbor UCLA Medical Center, Torrance, CA

6:32am–6:38am Smartphone-Based Goniometers Versus Standard Goniometers: Accuracy in a Clinical Setting
Scott Duncan, MD, MPH, MBA, Ochsner Health System, New Orleans, LA

6:38am–6:44am Correlation of a Novel Grading System for Orthopedic Postoperative Complications with Hospital Stay and Readmission
Dorothy Y. Harris, MD, The University of Texas Medical Branch Galveston, TX

6:44am–6:50am Treatment of Degenerative Lumbar Spondylolisthesis with Fusion or Decompression Alone Results in Similar Rates of Reoperation at 5 Years
John S. Vorhies, MD, Stanford Hospital and Clinics, Stanford, CA

6:50am–6:56am Clinical Outcome Following Single Level Cervical Disc Arthroplasty in a Military Population
J. Matthew Cage, DO, Tripler Army Medical Center, Honolulu, HI

6:56am–7:02am Risk Factors for Lumbar Laminectomy Surgical Site Infection in a Majority Minority Patient Population
Aniebiet-Abasi Uko Benjamin Udofia, MD, MBA, Howard University Hospital, Washington, DC

7:02am–7:20am Discussion

Symposium 1 — Tumor Update

Moderator: Patrick P. Lin, MD

7:20am–7:35am Management of Spine Metastases
Justin Bird, MD, MD Anderson Cancer Center, Houston, TX

7:35am–7:50am Management of Long Bone Metastases
Amalia Decomas, MD, CORE Institute, Gilbert, AZ

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

Thursday, July 31, 2014

(Presenters and times are subject to change.)

Disclosure Information is listed on pages 33-39.

7:50am–8:05am Soft Tissue Lumps and Bumps
Jeffrey Krygier, MD, Santa Clara Medical, Santa Clara, CA

8:05am–8:10am Discussion

8:10am–8:30am **Break — Please visit Exhibitors and Posters**

Symposium 2 — Instability of the Elbow, Wrist, and Hand in the Athlete: A Case Based Approach

Moderator: Thomas R. Hunt III, MD

8:30am–9:10am Panel Discussion
Thomas R. Hunt, III, MD, Baylor College of Medicine, Houston, TX
E. Anne Ouellette, MD, Physicians for the Hand, Coral Gables, FL
Randall W. Viola, MD, The Steadman Clinic, Vail, CO

9:10am–9:20am Discussion

General Session 2 — BOC Report and Presidential Guest Speaker

Moderator: Valerae O. Lewis, MD

9:20am–9:30am BOC Report
Robert R. Slater Jr., MD, Folsom, CA

9:30am–10:10am Why the Touchy/Feely Competencies Are Important
Dempsey S. Springfield, MD, Boston, MA

10:10am–10:30am **Break — Please visit Exhibitors and Posters**

Symposium 3 — Sports Medicine

Moderators: Raffy N. Mirzayan, MD
John "Trey" Green III, MD

10:30am–11:20am Hot Topics in Sports Medicine — A Case Based Approach
Keith Kenter, MD, University of Cincinnati, Cincinnati, OH
Dean K. Matsuda, MD, Kaiser West Los Angeles Medical Center, Los Angeles, CA

11:20am–12:20pm **WOA Luncheon Industry Presentations — Cadence Pharmaceuticals, Inc. and Pacira Pharmaceuticals, Inc.**
(Not for CME Credit)

Concurrent Session 3 — Basic Science/Tumor *(Grand Ballroom Salon 1)*

Moderator: Cynthia M. Kelly, MD

12:20pm–12:26pm Comparison of a Novel Oxysterol Molecule and Rhbmp2 Fusion Rates in a Rabbit Posterolateral Lumbar Spine Model
Trevor P. Scott, MD, University of California Los Angeles, Los Angeles, CA
**Presented by Jared Niska, MD*

12:26pm–12:32pm Comparison of Bupivacaine and Liposomal Bupivacaine Toxicity in Articular Chondrocytes
Robert Quigley, MD, Loma Linda University Medical Center, Loma Linda, CA

12:32pm–12:38pm A Novel, Cadaveric Model of Trochlear Dysplasia
David R. Burk, MD, University of Arizona Medical Center, Tucson, AZ

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Thursday, July 31, 2014

(Presenters and times are subject to change.)

Disclosure Information is listed on pages 33-39.

12:38pm–12:44pm — Internet and Orthopaedic Surgery: The Prevalence and Value of Social Media in Orthopaedic Patients
Emily J. Curry, BA, Brigham and Women's Hospital and Boston University School of Medicine, Boston, MA

12:44pm–12:50pm — Characterization of Acetabular Articular Cartilage Dimensions Using Reformatted MRI
Stephanie Pun, MD, Boston Children's Hospital, Boston, MA

12:50pm–12:56pm — Radiographic and Clinical Results of Revision Limb Salvage After Removal of Compression Osseointegration Implant
Raffi Avedian, MD, Stanford University, Palo Alto, CA

12:56pm–1:02pm — Why Go Wide? Outcomes of Marginal Surgery in Atypical Neurofibroma and Low-Grade MPNST
Nicholas Bernthal, MD, Huntsman Cancer Institute, Salt Lake City, UT
**Presented by Jared Niska, MD*

1:02pm–1:08pm — Incidence and Implications of Intra-Articular Radial Head Fractures in the Pediatric Patient
Ryan R. Fader, MD, University of Colorado Hospital, Auroro, CO

1:08pm–1:30pm — Discussion

Concurrent Session 4 — Pediatrics *(Plaza 1 & 2)*

Moderator: Howard Epps, MD

12:20pm–12:26pm — Diagnosis of DDH by Ultrasound Screening in Infants with Risk Factors
Thu-Ba Leba, MD, The University of Texas Medical Branch, Galveston, TX

12:26pm–12:32pm — All Lateral Versus Medial and Lateral Flexible Intrameullary Nails for the Treatment of Pediatric Femoral Shaft Fractures
J. Matthew Cage, DO, Children's Medical Center of Dallas, Dallas, TX

12:32pm–12:38pm — Treatment of Stable Pediatric Elbow Fractures with a Long Arm Gauntlet Cast
Byron H. Izuka, MD, Childrens Orthopedics of Hawaii, Aiea, HI

12:38pm–12:44pm — The Effects of Restraint Type on Pattern of Spine Injury in Children
Justin Ernat, MD, Children's Medical Center, Dallas, TX

12:44pm–12:50pm — A Comparison of Pin Configurations in Pediatric Distal Tibia Fractures: A Biomechanical Analysis
Jeffrey Jobe, MD, University of New Mexico, Albuquerque, NM
**Presented by Aditi Majumdar, MS*

12:50pm–12:56pm — Adult Function After Limb Lengthening or Amputation in Childhood for Congenital Limb Deficiency
Jennette L. Boakes, MD, Shriners Hospitals for Children, Northern California, Sacramento, CA

12:56pm–1:02pm — Reoperation Rates After Minimally Invasive Muscle-Tendon Lengthening for Cerebral Palsy
David A. Yngve, MD, The University of Texas Medical Branch, Galveston, TX

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

Thursday, July 31, 2014

(Presenters and times are subject to change.)

Disclosure Information is listed on pages 33-39.

1:02pm–1:08pm Pain Reduction in Non-Verbal Children with Cerebral Palsy Following Minimally Invasive Surgery and Ethanol Injections
Andrew G. Patton, MD, The University of Texas Medical Branch, Galveston, TX
**Presented by David A. Yngve, MD*

1:08pm–1:30pm Discussion

PA Session 1 — Trauma *(Plaza 3)*

Moderator: Kristi Posey, PA-C, ATC-LAT

12:20pm–1:30pm Fractures and Neurovascular Implications Workshop: Advanced Casting
David H. Chafey, MD, University of New Mexico School of Medicine, Albuquerque, NM

1:30pm–3:00pm **Scientific Poster Session**
(Grand Ballroom Foyer)
Note: Presenters will be available to answer questions.

3:00pm–5:00pm **Multimedia Education Session**
(Pikake Room)

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

Friday, August 1, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 33-39.

5:00am–6:00am **Scientific Poster Session** *(Grand Ballroom Foyer)*
Note: Presenters will be available to answer questions.

General Session 5 — Case Reviews

6:00am–7:00am Chat with "Chip" Routt — Review of Challenging Trauma Cases
Milton "Chip" Routt Jr., MD, University of Texas Health Science Center, Houston, TX

7:00am–7:05am Change Rooms

Concurrent Session 6 — Sports Medicine *(Grand Ballroom Salon 2)*

Moderator: John "Trey" Green III, MD

7:05am–7:11am Predictability of Hamstring Tendon Autograft Diameter for Anterior Cruciate Ligament Reconstruction Based on Pre-Operative Magnetic Resonance Imaging
Thomas J. Kremen Jr., MD, Cedars-Sinai Medical Center, Los Angeles, CA

7:11am–7:17am Knee Flexion in Collegiate Baseball Catchers Wearing or Not Wearing a Knee Saver
Keith T. Ellison, MD, The University of Texas Medical Branch, Galveston, TX
**Presented by Aaron M. Gray, BA*

7:17am–7:23am MRI Assessment of the Posterior Shoulder Capsule in Patients with Glenohumeral Internal Rotation Deficit (GIRD): Comparison to Controls
Grant H. Garcia, MD, University of Pennsylvania, Philadelphia, PA

7:23am–7:29am 3-D Modeling of Humeral Head Defects in Glenohumeral Instability: Clinical Implications of Lesion Morphology and the Glenoid Track Concept
Jaicharan Iyengar, MD, Columbia University Orthopaedic Surgery Center for Shoulder, Elbow & Sports Medicine, New York, NY

7:29am–7:35am Incidence of Meniscal Injury and Chondral Pathology in Anterior Tibial Spine Fractures of Children
Justin J. Mitchell, MD, University of Colorado, Aurora, CO

7:35am–7:41am Mental Health Medication Use Predictive of Poor Outcome After Femoroacetabular Impingement Surgery in a Military Population
Justin Ernat, MD, Tripler Army Medical Center, Honolulu, HI

7:41am–7:47am Platelet-Rich Plasma Treatment Improves Outcome for Chronic Proximal Hamstring Injuries in an Athletic Population
Ryan R. Fader, MD, University of Colorado Hospital, Auroro, CO

7:47am–7:53am Return to Sports in High Demand and Overhead Athletes After Arthroscopic Laterjet for Shoulder Instability
Xinning Li, MD, Alps Surgery Institute, Annecy, France

7:53am–8:05am Discussion

Concurrent Session 7 — Total Hip *(Plaza 1 & 2)*

Moderator: Thomas C. Barber, MD

7:05am–7:11am Factors Determining Discharge Destination for Patients Undergoing Total Joint Replacement
Behnam Sharareh, BS, University of California, Orange, CA
**Presented by Ran Schwarzkopf, MD, MSc*

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

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(Presenters and times are subject to change.)
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7:11am–7:17am — Impact of Chronic Kidney Disease Stage on Outcomes After Total Hip or Knee Arthroplasty
Raveesh D. Richard, MD, Geisinger Medical Center, Danville, PA

7:17am–7:23am — Implant Related Complications in Total Hip and Knee Arthroplasty
Michael R. Dayton, MD, University of Colorado School of Medicine, Aurora, CO

7:23am–7:29am — The Reliability of Modern Alumina Bearings in Total Hip Arthroplasty
Gwo-Chin Lee, MD, University of Pennsylvania Medical Center, Philadelphia, PA

7:29am–7:35am — Periacetabular Osteotomy to Antevert and Uncover the Hip in Pincer Femoroacetabular Impingement
Stephanie Pun, MD, Boston Children's Hospital, Boston, MA

7:35am–7:41am — Hip and Knee Osteoarthritis in Patients with Non-Insulin-Dependent Diabetes Mellitus (NIDDM)
Laurie L. Jansky, MS, The University of Texas Medical Branch, Galveston, TX

7:41am–7:47am — Proximal Femur Fracture with a Second Generation Tapered Hip Stem
Paul M. Lichstein, MD, The Rothman Institute, Philadelphia, PA

7:47am–7:53am — Arthroscopic Surgical Outcomes of Mild Dysplasia Versus Focal Pincer Femoroacetabular Impingement: A Multicenter Case Control Study
Dean K. Matsuda, MD, Kaiser West Los Angeles Medical Center, Los Angeles, CA

7:53am–8:05am — Discussion

PA Session 2 — Sports Medicine *(Plaza 3)*

Moderator: Kristi Posey PA-C, ATC-LAT

7:05am–8:05am — Concussions, and Their Impact. Concussions Workshop: ImPACT Concussion Test
Melinda Roalstad, PA-C, Think Head First, Park City, UT

8:05am–8:25am — **Break — Please visit Exhibitors and Posters**

Symposium 4 — Trauma

Moderator: Milton "Chip" Routt Jr., MD

8:25am–8:35am — Clavicle Fractures and AC Joint Injuries: When Should We Fix?
Gil Ortega, MD, Sonoran Orthopaedic Trauma Surgeons, Scottsdale, AZ

8:35am–8:45am — Proximal Femur Fractures: From Plate to Nail and Back Again
David H. Chafey, MD, University of New Mexico School of Medicine, Albuquerque, NM

8:45am–8:55am — Ankle Syndesmosis Fixation and Removal: An Update
Rick J. Gehlert, MD, University of New Mexico School of Medicine, Albuquerque, NM

8:55am–9:05am — Geriatric Acetabular Fractures: Too Old to Fix?
Milton "Chip" Routt Jr., MD, University of Texas Health Sciences Center, Houston, TX

9:05am–9:15am — Discussion

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General Session 8 — AAOS Report and Howard Steel Lecture

Moderator: Valerae O. Lewis, MD

9:15am–9:30am — AAOS Report
Frederick M. Azar, MD, President, American Academy of Orthopaedic Surgeons, Memphis, TN

9:30am–10:20am — Howard Steel Lecture
Three Glasses of Milk Per Day: Essential Nutrition or "Udderly" Ridiculous?
Walter C. Willett, MD, PhD, Harvard School of Public Health, Boston, MA

10:20am–10:40am — **Break — Please visit Exhibitors and Posters**

Symposium 5 — Health Policy Update from Orthopaedic Leadership

Moderator: Brian S. Parsley, MD

10:40am–11:20am — Panel Discussion
Frederick M. Azar, MD, President, American Academy of Orthopaedic Surgeons, Memphis, TN
Thomas C. Barber, MD, Chair of AAOS Council on Advocacy, Oakland, CA

11:20am–11:30am — Discussion

Concurrent Session 9 — Trauma *(Grand Ballroom Salon 1)*

Moderator: David H. Chafey, MD

11:30am–11:36am — Acute Upright Radiographs of Acute Clavicle Fractures Reveal Increased Displacement and Deformity
Justin B. Ledesma, MD, Stanford Hospital and Clinics, Stanford, CA

11:36am–11:42am — Comparison of Skin Surface Pressure Beneath Bias-Cut Stockinette Verses Elastic Bandage Wrapped Splints
Krysten Bell, MD, Loma Linda University, Loma Linda, CA

11:42am–11:48am — MRI Evaluation of the Knee with Non-ferromagnetic External Fixators: Cadaveric Knee Model
Andrew Yang, BS, Loma Linda University, Loma Linda, CA

11:48am–11:54am — The Prevalence of Sacro-Iliac Joint Degeneration in Asymptomatic Adults: A Review of 500 CT Scans
Jonathan-James T. Eno, MD, Stanford Hospital and Clinics, Stanford, CA

11:54am–12:00pm — Bilateral Sacral Fractures Are Highly Associated with Lumbopelvic Instability
Tiffany N. Castillo, MD, Stanford Hospital and Clinics, Stanford, CA

12:00pm–12:06pm — Are the Fractures We Treat Becoming More Complex? Trends in Orthopaedic Fracture and Injury Severity, a Level-I Trauma Center Experience
Timothy Alton, MD, University of Washington/Harborview Medical Center, Seattle, WA

12:06pm–12:12pm — Does Pelvic Embolization Increase Infection Rates in Patients Who Undergo Open Treatment of Acetabular Fractures
Reza Firoozabadi, MD, MA, Harborview Medical Center, Seattle, WA

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

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(Presenters and times are subject to change.)
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12:12pm–12:30pm Discussion

Concurrent Session 10 — Upper Extremity 1 *(Plaza 1 & 2)*

Moderator: Basil Besh, MD

11:30am–11:36am Coracoclavicular Ligament Reconstruction Without Hardware, Drills, or Bone Tunnels: A Novel All-Arthroscopic Technique
William Workman, MD, Walnut Creek Orthopedics & Sports Medicine, Walnut Creek, CA

11:36am–11:42am The Incidence of Propionibacterium Acnes in Shoulder Arthroscopy
Wesley Nottage, MD, The Sports Clinic Orthopedic Medical Associates, Inc., Laguna Hills, CA
**Presented by Michael J. Chuang, MD*

11:42am–11:48am Effect of Ulnar Variance on Distal Radius Bone Density and Failure Load
Danielle Casagrande, MD, The University of Texas Medical Branch, Galveston, TX

11:48am–11:54am Isolated Metacarpal Shaft Fractures in an Active Duty Population
Emily Morgan, MD, Madigan Army Medical Center, Tacoma, WA

11:54am–12:00pm Medicare Insurance Prolongs Hospital Stay Following Total Shoulder Arthroplasty in Patients Discharged to Skilled Nursing Facility
Mark E. Mildren, MD, Loma Linda University, Loma Linda, CA

12:00pm–12:06pm Preoperative Costs Associated with Evaluation and Therapy Prior to Shoulder Arthroplasty
Adam Z. Khan, BS, David Geffen School of Medicine at UCLA, Los Angeles, CA

12:06–12:30pm Discussion

PA Session 3 — Radiology *(Plaza 3)*

Moderator: Kristi Posey, PA-C, ATC-LAT

11:30pm–12:30pm Benign or Malignant? Workshop: Interactive Quiz
Behrang Amini, MD, MD Anderson Cancer Center, Houston, TX

12:30pm–2:00pm **Scientific Poster Session**
(Grand Ballroom Foyer)
Note: Presenters will be available to answer questions.

2:00pm–4:00pm **Multimedia Education Session**
(Pikake Room)

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

Saturday, August 2, 2014

(Presenters and times are subject to change.)

Disclosure Information is listed on pages 33-39.

5:00am–6:00am **Scientific Poster Session** *(Grand Ballroom Foyer)*
Note: Presenters will be available to answer questions.

Symposium 6 — Hot Topics in Hip and Knee Replacement

Moderator: William J. Maloney III, MD

6:00am–6:12am Update on Venous Thromboembolic Prophylaxis — Most Recent Guidelines
Steven T. Woolson, MD, Stanford School of Medicine, Red Wood City, CA

6:12am–6:24am Bearings and Tapers in Total Joint Replacment — Concerns and Trends
James I. Huddleston III, MD, Stanford School of Medicine, Red Wood City, CA

6:24am–6:36am Diagnosing and Managing Periprosthetic Joint Infection
Nicholas J. Giori, MD, PhD, Stanford School of Medicine, Red Wood City, CA

6:36am–6:50am Discussion

6:50am–7:05am **Second Business Meeting**

General Session 11 — Special Lecture

7:05am–7:35am Pitfalls of Orthopaedic Imaging
Behrang Amini, MD, MD Anderson Cancer Center, Houston, TX

Symposium 7 — Foot and Ankle

Moderator: Roger A. Mann, MD

7:35am–7:45am Hallux Rigidus
William C. McGarvey, MD, University of Texas Health Science Center, Houston, TX

7:45am–7:55am Talus Osteochondral Lesions
Richard L. Beaver, MD, University of Texas Health Science Center, Houston, TX

7:55am–8:05am Posterior Tibial Tendon Dysfunction
Roger A. Mann, MD, Oakland Bone and Joint Specialists, Oakland, CA

8:05am–8:15am Hallux Valgus
Andrew Haskell, MD, Palo Alto Medical Foundation, Palo Alto, CA

8:15am–8:25am Discussion

General Session 12 — WOA/OREF Young Investigator Awards

Moderator: Melvyn A. Harrington Jr., MD

8:25am–8:33am Conventional Versus Virtual Radiographs of the Injured Pelvis and Acetabulum
Julius A. Bishop, MD, Stanford University School of Medicine, Stanford, CA

8:33am–8:41am Risk of Spermatic Cord Injury During Anterior Pelvic Ring and Acetabular Surgery: An Anatomical Study
Reza Firoozabadi, MD, MA, Harborview Medical Center, Seattle, WA

8:41am–8:49am Patients' Willingness to Contribute to Cost of Novel Implants in Total Joint Arthroplasty
Ran Schwarzkopf, MD, MSc, University of California, Irvine School of Medicine, Orange, CA

8:49am–8:55am Discussion

8:55am–9:20am **Break — Please Visit with Exhibitors and Posters**

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

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(Presenters and times are subject to change.)
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General Session 13 — WOA Resident Awards

Moderator: Bryan S. Moon, MD

9:20am–9:28am — Immediate Weight Bearing as Tolerated After Locked Plating of Fragility Fractures of the Femur
Seth H. Criner, DO, Legacy Emanuel, Portland, OR

9:28am–9:36am — Infection Rate of Intramedullary Nailing Following Temporizing External Fixation in Closed Fractures of the Femoral Diaphysis
Joseph W. Galvin, DO, Madigan Army Medical Center, Fort Lewis, WA

9:36am–9:44am — Local Versus Distal Transplantation of Human Neural Stem Cells Following Chronic Spinal Cord Injury
Michael Githens, MD, Stanford University, Stanford, CA

9:44am–9:52am — One Brace, One Visit: Treatment of Distal Radius Buckle Fractures in Children with a Removable Wrist Brace and No Follow-up Visit
Megan Kuba, MD, Kapiolani Medical Center for Women and Children, Honolulu, HI

9:52am–10:00am — In Vivo Evaluation of Electrospun Polymer Grafts for ACL Tissue Engineering
Natalie L. Leong, MD, University of California, Los Angeles/West Los Angeles Veterans Administration, Los Angeles, CA

10:00am–10:08am — Controlled Release of Vancomycin and Tigecycline from an Orthopaedic Implant Coating Prevents Staphylococcus Aureus Infection in an Open Fracture Animal Model
Jared Niska, MD, University of California Los Angeles, Los Angeles, CA

10:08am–10:16am — Do Patients with Income-Based Insurance Have Access to Total Joint Arthroplasty?
Duy Phan, MD, UCI Medical Center, Orange, CA

10:16am–10:25am — Discussion

General Session 14 — OREF and Presidential Address

Moderator: Melvyn A. Harrington Jr., MD

10:25am–10:30am — OREF Update
Ramon L. Jimenez, MD, Monterey, CA

10:30am–11:00am — **Presidential Address**
Making the 'Old' New Again
Valerae O. Lewis, MD, MD Anderson Cancer Center, Houston, TX

Symposium 8 — Practice Management/Medical Legal

Moderator: Ramon L. Jimenez, MD

11:00am–11:20am — Liability Exposure for New Orthopedic Technologies — All That Glitters May Not Be Gold!
B. Sonny Bal, MD, JD, MBA, University of Missouri, Columbia, MO

11:20am–11:40am — The Future of Orthopaedic Malpractice Claims
Lawrence R. Brenner, JD, Yale School of Medicine, New Haven, CT

11:40am–11:50am — Discussion

11:50am–12:00pm — Refreshment Break/Change Rooms

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

Saturday, August 2, 2014

(Presenters and times are subject to change.)

Disclosure Information is listed on pages 33-39.

Concurrent Session 15 — Total Knee *(Grand Ballroom Salon 1)*

Moderator: Brian S. Parsley, MD

12:00pm–12:06pm — Intra-Articular Injection of Low Molecular Weight Fraction of 5% Human Serum Albumin Is Associated with Sustained Improvements in Moderate-to-Severe Osteoarthritis Knee Pain
Nathan Wei, MD, University Orthopaedics Services, Amherst, NY; Central Kentucky Research Associates, Lexington, KY; Center for Pharmaceutical Research, Kansas City, MO; Altoona Center for Clinical Research, Duncansville, PA; Arthritis Treatment Center, Frederick, MD; Danville Orthopaedic Clinic, Danville, VA; Rochester Medical Research, Rochester, NY; Physician Research Collaboration, Lincoln, NE; Alabama Clinical Therapeutics, LLC, Birmingham, AL

12:06pm–12:12pm — Los Angeles County Total Hip and Knee Patients Are More Engaged in Their Health Behavior
Cory Pham, BS, Harbor-UCLA Medical Center, Los Angeles, CA

12:12pm–12:18pm — Perioperative Outcomes of Primary Total Knee Arthroplasty Stratified by Body Mass Index
Jake R. Adams, MD, Oregon Health & Science University, Portland, OR

12:18pm–12:24pm — Outcomes of Total Knee Arthroplasty in Relation to Pre-Operative Patient Reported and Radiographic Measures: Data from the Osteoarthritis Initiative
Ran Schwarzkopf, MD, MSc, University of California, Irvine School of Medicine, Orange, CA

12:24pm–12:30pm — Does Increased Topside Conformity in Modular Total Knee Arthroplasty Lead to Increased Backside Wear?
Ran Schwarzkopf, MD, MSc, University of California, Irvine School of Medicine, Orange, CA

12:30pm–12:36pm — Does a Pathway Lead to Consistent Length of Stay for Total Joint Replacement Patients?
Avinash Chaurasia, MD, University of California, Irvine School of Medicine, Orange, CA
**Presented by Ran Schwarzkopf, MD, MSc*

12:36pm–12:42pm — A Clinical Decision Support Tool to Predict Difficult Surgical Exposure in Aseptic Revision Knee Arthroplasty
Paul M. Lichstein, MD, The Rothman Institute, Philadelphia, PA

12:42pm–12:48pm — Engagement of PCL During Flexion with Custom TKR Implants
Ryan O'Shea, MD, St. Mary's Medical Center, San Francisco, CA

12:48pm–1:00pm — Discussion

Concurrent Session 16 — Upper Extremity 2 *(Plaza 1& 2)*

Moderator: Robert R. Slater Jr., MD

12:00pm–12:06pm — The Design and Testing of Patient-Specific Jigs for Targeted Glenoid Component Positioning in Total Shoulder Arthroplasty
James Van den Bogaerde, MD, University of California Davis, Sacramento, CA

12:06pm–12:12pm — Readmission Rates Are Not Affected by Length of Hospitalization Following Total Shoulder Arthroplasty
Krysten Bell, MD, Loma Linda University, Loma Linda, CA
**Presented by Mark E. Mildren, MD*

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

Saturday, August 2, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 33-39.

12:12pm–12:18pm Combining Biologic Therapies Increases Type I Collagen Content of Rotator Cuff and Biceps Tendon Explants
Jamie M. Fleming, BS, The University of Arizona, Tucson, AZ

12:18pm–12:24pm Outcomes of Ulnar Shortening Osteotomy for the Treatment of Ulnar-Sided Wrist Pain
Ryan Mitchell, MD, University of South Alabama, Mobile, AL

12:24pm–12:30pm In-Patient Trends and Complications After Total Elbow Arthroplasty in the United States
Nathan Orvets, MD, Boston University School of Medicine and The University of Massachusetts Medical Center, Boston/Worcester, MA

12:30pm–12:36pm Collagenase Injection for Dupuytren's Contracture in the Anticoagulated Patient
J. Grant Zarzour, MD, University of South Alabama, Mobile, AL

12:36pm–12:42pm Pullout Strength and Stiffness of a Non-Metallic Suture Anchoring System for Repair of the Central Slip of the Extensor Mechanism at the Proximal Interphalangeal Joint
Elizabeth Mikola, MD, University of New Mexico, Albuquerque, NM
**Presented by Evan Baldwin, MD*

12:42pm–12:48pm Damage in the Distal Radius Following Treatment for Extra-Articular Fractures (AO 23-A3.2) Using Two-Column Volar Plates
Deana Mercer, MD, University of New Mexico, Albuquerque, NM
**Presented by Evan Baldwin, MD*

12:48pm–12:54pm Pegged Posterior Augmented Versus Non-Augmented Glenoids: A Biomechanical Evaluation
Tim Wang, MD, Stanford University Medical Center, Stanford, CA

12:54pm–1:00pm Discussion

PA Session 4 — Review PANCE/PANRE/CAQ *(Plaza 3)*

Moderator: Kristi Posey, PA-C, ATC-LAT

12:00pm–1:00pm PANCE/PANRE/CAQ Workshop: Encompassing Review
Craig Roorda, PA-C & Mark Pilarczyk, PA-C, MD Anderson Cancer Center, Houston, TX

1:00pm–2:00pm **Scientific Poster Session** *(Grand Ballroom Foyer)*
Note: Presenters will be available to answer questions.

2:00pm–4:00pm **Multimedia Education Session** *(Pikake Room)*
Note: Presenters will be available to answer questions.

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

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2014 Scientific Program Abstracts — Thursday

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

Thursday, July 31, 2014

General Session 1 — Assorted Topics

Moderators: **Richard L. Beaver, MD**
Justin Bird, MD

6:20am–6:26am

Gravity Versus Manual External Stress View in Evaluating Ankle Stability

Thu-Ba Leba, MD
Vinod K. Panchbhavi, MD

Introduction: Differentiating SER II (stable) and SER IV (unstable) isolated fibular fractures is key for treatment. This prospective, case-controlled study assessed the effectiveness of gravity versus manual external rotation stress testing in detecting widening of the medial clear space when compared with the uninjured contralateral side. The effects of muscle relaxation due to anesthesia on medial clear space widening were also studied.

Methods: Manual external rotation stress and gravity stress tests were performed on the injured and uninjured ankles. When the fracture pattern was unstable, views were repeated in the operating room with the patient under anesthesia. The statistical methodology included paired t testing.

Results: Twenty patients were enrolled in the study. Average time from injury to examination was 4.3 days. When compared with the uninjured side, gravity stress views showed a significant increase in medial clear space widening. However, the finding was not clinically significant. Three patients had an SER IV fracture pattern and stress views were repeated with them under anesthesia in the operating room prior to surgery. Comparison of medial clear space for gravity versus manual stress views while patients were awake and with muscle relaxation showed no difference.

Discussion and Conclusion: Our data suggest that gravity stress views are as effective as manual external rotation stress views in detecting medial clear space widening in isolated fibular fractures. Potential muscle spasm does not appear to hinder widening of the medial clear space, indicating that gravity stress testing is clinically valid.

Notes:

6:26am–6:32am

Medial Malleolus Fleck Sign

Kenneth Nwosu, MD
Martina Shoukralla
Thomas G. Harris, MD

Introduction: The determination of an unstable ankle fracture continues to be somewhat controversial. External rotation stress test have been used for surgical decision making in Supination External Rotation (SER) ankle injuries. The "fleck sign" is a radiographic parameter used to diagnose complete ligamentous disruption. The objective of the current study is to assess the association between a medial malleolus fleck sign and complete deltoid disruption in SER ankle injuries

Methods: We performed a cross sectional analysis reviewing all encountered patients who sustained an ankle fracture in 2011 at a level one academic trauma center. Those who had SER injuries with an intact medial malleolus and at least one post-operative or two post-injury visit were recorded. Medial malleolus fleck sign was also recorded. The primary measurement was association between medial malleolus fleck sign and complete deltoid rupture, as indicated by the need for surgical fixation. Using contingency tables, double tailed exact fisher test was used to determine association between variables.

Results: Sample size was 108. Mean age was 39 (15 to 72). 18 (16.7%) had a positive fleck sign. Of the fleck positive subjects, five were stress positive and two underwent surgical fixation. There was no association between fleck sign and medial clear space dynamic widening. There was no association between fleck sign and complete deltoid rupture.

Discussion and Conclusion: Although positive fleck sign is usually indicative of complete ligamentous disruption, sometimes dictating need for surgical intervention, this does not seem to be the case with ankle fractures. Although approximately one out of five SER ankle fractures with intact medial malleolus had a fleck sign, and one out of three patients with positive flex sign widened dynamically, this was not statistically

Notes:

6:32am–6:38am

Smartphone-Based Goniometers Versus Standard Goniometers: Accuracy in a Clinical Setting

Scott Duncan, MD, MPH, MBA
Bradford Waddell, MD
Mark Meyer, MD
Neil Duplantier, MD

Introduction: Joint goniometry is a commonly used tool in clinical assessment. Universal goniometers have been the gold standard for joint angle measurement. Recently, developers have utilized the gyroscope in smartphones to create goniometer applications. We hypothesize that iPhone-based goniometer applications will fail to reproduce the accuracy of the standard universal goniometer. In this study, we compare two popular iPhone-based goniometer applications with the gold standard universal goniometer for the measurement of the knee, hip and elbow joints.

Methods: After IRB approval, we developed a protocol involving three subjects, each with a joint (knee, hip, elbow) held to a specific angle using a brace. Four physicians measured each angle 35 times with one of three goniometers: the standard universal 12" goniometer (UG), DrGoniometer (DrG) and SimpleGoniometer (SG) (both iPhone 5 based). Finally, we repeated the experiment for a second angle. To decrease bias in the measurements, we rotated between joints for each measurement. Joint angle was set in a blinded, independent fashion.

Results: For the knee, average angles measured with the UG were 34.4° and 83.8°, with DrG 38.9° and 83.1°, and with SG 43.1° and 77.8°. For the hip, average angles measured with the UG were 40.1° and 61.8°, with DrG 39.6° and 60.6°, and with SG 41.7° and 58.1°. For the elbow, average angles measured with the UG were 28.7° and 106°, with DrG 29.5° and 96.6°, and with SG 29.2° and 100.4°.

Conclusion: iPhone based applications have many clinical utilities and can save both time and space. No previous study has compared iPhone-based goniometer applications to the standard goniometer in a clinical setting. In our study, we prove that iPhone based goniometry with the DrGoniometer application is a valid and useful tool for measuring joint angles in the clinical setting.

Notes:

6:38am–6:44am

Correlation of a Novel Grading System for Orthopedic Postoperative Complications with Hospital Stay and Readmission

Dorothy Y. Harris, MD
Ronald W. Lindsey, MD

Introduction: There is no universally accepted classification system that reliably scores severity of orthopedic postoperative complications. Two reports (2011 and epub 2013) have proposed adaptations of the widely accepted Clavien-Dindo general surgery complications classification to standardize

grading of postoperative complications of THA and TKA, respectively. The former demonstrated general applicability and high interobserver and intraobserver reliability. The aim of our study was to assess the relation of the proposed schemes with further modification by us for application to length of hospital stay and hospital readmission. We hypothesized that our system would help identify complications that significantly affect hospitalization.

Methods: We analyzed postoperative complications from date of surgery to final follow-up in a consecutive series of 197 patients who underwent primary THA or TKA at our institution. Data analyzed included patient demographics, length of hospital stay, and number of readmissions according to grade of complications.

Results: There were 247 complications. Average length of follow-up was 13.5 months (range 3-36 months). There was a trend for increasing length of hospital stay and increasing number of readmissions with increasing grade of complications (excepting grade V, death) for these patients who underwent total joint arthroplasty. The most prevalent complications impacting length of stay were bleeding, pulmonary embolus, and DVT. The most prevalent complications associated with readmission were deep infection requiring I&D and intravenous antibiotics, resection arthroplasty, arthrofibrosis requiring manipulation under anesthesia, and/or arthroscopic lysis of adhesions.

Discussion and Conclusion: Applying a novel complications scheme retrospectively, we observed a trend toward positive relationships of hospital length of stay and readmission rate to grade of complications following total joint arthroplasty. Such a classification system may prove useful as health care professionals and other entities are increasingly required to systematically evaluate lengths of hospital stay and readmission rates as surrogate indicators for quality assessment.

Notes:

6:44am–6:50am

Treatment of Degenerative Lumbar Spondylolisthesis with Fusion or Decompression Alone Results in Similar Rates of Reoperation at 5 Years

John S. Vorhies, MD
Tina Hernandez-Boussard, PhD, MPH, MS
Todd Alamin, MD

Introducton: Degenerative lumbar spondylolisthesis can be treated by decompression with or without segmental fusion. Fusion has traditionally been considered the preferred treatment. We hypothesized that, for treatment of lumbar degenerative spondylolisthesis, rates of reoperation after decompression alone would be higher than after decompression and fusion. We also sought to identify risk factors for reoperation-among patients with degenerative spondylolisthesis.

Methods: We undertook a population-based analysis of administrative discharge records from California, Florida, and New York state between 2005-2011, utilizing Healthcare Cost and Utilization Project data. We identified all patients who had degenerative spondylolisthesis who were treated with decompression alone or fusion and compared their rates of reoperation at 1, 3 and 5 years from the index operation. We used a logistic regression model to generate risk-adjusted odds of all-cause readmissions

Results: Our sample consisted of 78,564 patients with degenerative spondylolisthesis; 7,225 treated with decompression, 71,339 treated with fusion. 30-day all-cause readmission rate was 10.02% for decompression and 11.87% for fusion. Rates of reoperation were slightly higher for decompression vs fusion at 1 year; 5.95% vs 4.48% and 3 years;11.59% vs 10.32% but at 5 years rates of re-operation were not statistically different; 13.67% vs 13.97%.

Discussion and Conclusion: Here we show that treatment of degenerative spondylolisthesis with fusion or decompression alone results in similar rates of reoperation at 5 years. Patients treated with decompression alone that had a second operation tended to have the operation sooner. This medium term data indicates that decompression alone may be a viable treatment for degenerative spondylolisthesis in some cases and may not result in continued destabilization as prior data suggest. This may represent a cost saving alternative to current practice.

Notes:

6:50am–6:56am

Clinical Outcome Following Single Level Cervical Disc Arthroplasty in a Military Population

J. Matthew Cage, DO
Capt. Kim Driftmier, MD
CPT Kevin Krul, MD
COL Joseph Orchowski, MD

Introduction: In recent clinical studies cervical disc arthroplasty (CDA) has demonstrated equivalent and superior clinical results compared to anterior cervical discectomy and fusion (ACDF) for the treatment of symptomatic cervical disc disease. It is hypothesized that arthroplasty should allow for earlier return to activity and protect against adjacent level disease. The rigors of active duty military service are often not compatible with prolonged conservative management of symptomatic cervical disc degeneration, necessitating surgical intervention for those who wish to remain on active duty. To our knowledge no prior published study has determined the return to duty rate for either ACDF or CDA in a military population. The purpose of our study is to demonstrate the clinical outcome, as measured by the neck disability index (NDI), and return to duty (RTD) rate in a population of active duty service members undergoing a single level cervical disc arthroplasty compared to a control population undergoing a single level ACDF.

Methods: A retrospective review was performed on all patients undergoing either single level CDA or ACDF at a military medical center between the years 2008 and 2012. Only patients on active duty status were included for review. The primary outcome measures were NDI and return to active duty. NDI scores were collected prospectively and return to duty status was obtained from the medical record. Patients were evaluated preoperatively, and at 3, 6 months. Statistical analysis was carried out using Welch's t test and Fisher's exact test.

Results: Fifty nine consecutive active duty service members were identified with single level symptomatic cervical disc disease that had failed conservative treatment. Forty eight patients elected to undergo cervical disc arthroplasty, while 11 underwent ACDF. Thirty-two of 48 (67%) active duty service members undergoing cervical disc arthroplasty provided a pre-operative NDI. Clinical follow up data was collected on 29 arthroplasty patients (91%), leaving three patients lost to follow up. Among the 11 patients undergoing ACDF, 5 (45%) were available for clinical follow up. The two groups were similar in regard to age and gender. Pre-operative mean NDI scores for the arthroplasty and ACDF groups were 32 and 41 respectively. At the three and six months follow up, the arthroplasty group demonstrated statistically significant improvement in NDI scores (18 and 20, respectively). At the three and six month follow up, the arthroplasty group had consistently better NDI scores compared to the ACDF group, but this finding was only statistically significant at 6 months (18 vs. 35, 20 vs. 57). RTD data was collected on all patients in both groups. At six months the RTD rate was substantially higher in the arthroplasty group (78% arthroplasty versus 27% ACDF). The medical board rate for arthroplasty and ACDF patients was 13% and 55% respectively. In the arthroplasty group those who returned to duty demonstrated a significantly lower pre-operative NDI compared to those who were medically boarded from military service (26 vs. 51).

Conclusion: Cervical disc arthroplasty is a successful procedure when performed on an active duty military population with good clinical outcome and high return to duty rate. When compared to a demographically similar population of patients undergoing ACDF, arthroplasty patients had better NDI scores and higher return to duty rates at 6 months. When arthroplasty was performed, those patients with a lower pre-operative NDI were more likely to return to duty at 6 months compared to those with higher NDI scores.

Notes:

6:56am–7:02am

Risk Factors for Lumbar Laminectomy Surgical Site Infection in a Majority Minority Patient Population

Aniebiet-Abasi Uko Benjamin Udofia, MD, MBA
Damirez Fossett, MD
Tolulope Oyetunji, MD, MPH
Terry Thompson, MD

Introduction: Surgical site infection (SSI) following lumbar spine surgery remains a serious post-operative complication with rates of infection ranging from 2% to 12%. Several

patient, microbiological and procedure-related risk factors have been identified in the literature, but how these findings differ based upon race and/or socioeconomic status has not previously been explored.

Methods: A retrospective review of surgical site infection in 131 lumbar laminectomy cases performed by a single surgeon at a Level-1 trauma center in an urban setting with a majority minority patient population. Utilizing Stata, regression analysis was performed to determine the effects of race, age, sex, use of drugs, alcohol or tobacco, co-morbidities including HIV and diabetes mellitus, and homelessness upon the likelihood of developing a post-operative infection.

Results: Overall incidence of SSI was 19% with a mean of 15 days until initial presentation. 55% of the patient population was female with a mean age of 54 years. 85.5% of the patient population identified as Black, 7.6% as Caucasian, 5.4% as Hispanic and 1.5% as another race not specified. 92% of total infections occurred in Black patients, with the remaining 8% occurring in Caucasian patients. Of the remaining dependent variables, positive HIV status and homelessness were identified as significant risk factors for the development of SSI.

Discussion and Conclusion: Incidence of SSI following lumbar laminectomy in our majority minority population is significantly higher than rates that have been previously reported in the literature. Factors contributing to this increased rate include positive HIV status and homelessness, which disproportionately affects minority populations. When considering mainly elective surgical procedures such as laminectomy, the decision to operate must include a comprehensive plan that demonstrates an awareness of the socioeconomic factors unique to this population that can lead to postoperative complications.

Notes:

Thursday, July 31, 2014

Concurrent Session 3 — Basic Science/Tumor

Moderator: Cynthia M. Kelly, MD

12:20pm–12:26pm

Comparison of a Novel Oxysterol Molecule and Rhbmp2 Fusion Rates in a Rabbit Posterolateral Lumbar Spine Model

Trevor P. Scott, MD
*Jared Niska, MD
Kevin H. Phan, MD
Haijun Tian, MD
Scott C. Montgomery
Jeffrey C. Wang, MD
Michael D. Daubs
Farhad Parhami, PhD, MBA

Introduction: The non-union rate following lumbar spinal fusion is potentially as high as 25%. Bone morphogenetic protein-2 (rhBMP2) has been used as a biological adjunct to promote bony fusion. However, recently there have been increasing concerns about BMP. Oxysterol 133 (Oxy133) has been shown to promote excellent fusion rates in rodent lumbar spine models and offers a potential alternative to rhBMP2. The purpose of this study is to compare the fusion rate of rhBMP2 and Oxy133 in a randomized control trial using a posterolateral lumbar rabbit spinal fusion model**.**

Materials and Methods: 24 male adult white New Zealand rabbits (3-3.5kg) underwent bilateral posterolateral lumbar spinal fusion at L4-L5. Rabbits were divided into 4 groups: control (A), 30 ug rhBMP2 (B), 20 mg Oxy133 (C), and 60 mg Oxy133 (D). At 4 weeks fusion was evaluated by fluoroscopy, and at 8 weeks the rabbits were sacrificed and fusion was evaluated radiographically, by manual palpation, histology and with microCT.

Results: Fusion rates at 4 weeks were as follows: group A 25%, group B 67.7%, group C 91.7%, and group D 90.0%. Fusion rates by radiographic analysis at 8 weeks were: group A 40.0%, group B 91.7%, group C 91.7%, and group D 100%. Evaluation of fusion masses by manual palpation of excised spines after sacrifice showed the following fusion rates: group A were 0% fused, group B were 83.3% fused, group C were 83.3% fused, and group D were 90% fused.

Conclusion: These findings in a rabbit model demonstrate that both low and high dose 20 mg Oxy133 appears to promote fusion that is equivalent to 30 ug rhBMP2 and significantly greater than the control group.

**The FDA has not cleared this drug and/or medical device for the use described in this presentation. (Refer to page 41.)*

Notes:

12:26pm–12:32pm

Comparison of Bupivacaine and Liposomal Bupivacaine Toxicity in Articular Chondrocytes

Robert Quigley, MD
Montri Wongworawat, MD
Sean Wilson, PhD
Noah Osman, BS
Hasan Syed, MD

Introduction: Intra-articular injections of local anesthetics are commonly used for management of chronic pain symptoms associated with degenerative joint disease and after arthroscopic procedures. Several studies suggest chondrotoxicity of standard bupivacaine. A new formulation of bupivacaine, liposomal bupivacaine, has recently been released, and its chondrotoxicity is not yet known. We performed a study to compare the chondotoxicity of liposomal bupivacaine to bupivacaine.

Questions/Purposes: We asked whether (1) bupivacaine is chondrotoxic; (2) liposomal bupivacaine is chondrotoxic; (3) liposomal bupivacaine is less chondrotoxic than standard bupivacaine; and (4) toxic effects are time dependent.

Methods: We harvested articular plugs from each of 12 bovine knee joints (total 72 plugs) and exposed them to either saline, 0.5% bupivacaine, or 1.3% liposomal bupivacaine for either 30 or 90 minutes. Twenty-four hours after treatment, chondrocyte viability was measured with use of a Live/Dead assay. An ANOVA test of variance was performed followed by a Holm-Sidak test to make pair-wise comparisons across conditions.

Results: Both bupivacaine and its liposomal formulation exhibited chondrotoxicity effect, but the latter was less toxic (percent viability in saline control: 70.5±8.6%, bupivacaine: 33.5±8.0%, and liposomal bupivacaine: 51.5±8.2%). Toxicity is also time dependent (percent viability at 30 min: 57.7±7.3%, 90 min: 45.9±8.9%).

Discussion and Conclusion: Bupivacaine and liposomal bupivacaine are both toxic to chondrocytes. Liposomal bupivacaine is less chondrotoxic than standard bupivacaine and may be safer for intra-articular analgesia. However, the clinical relevance of exposure duration and its effects is not known.

Notes:

12:32pm–12:38pm

A Novel, Cadaveric Model of Trochlear Dysplasia

David R. Burk, MD
Michael Christopher, BS
Ari Nicolini, MS
Bobby Dezfuli, MD
L. Daniel Latt, MD, PhD

Introduction: Recurrent patellar instability has been reported up to 44% of patients following initial patellar dislocation. Up to 85% of patients with chronic patellar instability have trochlear dysplasia. The goal of this project is to create a simple, reproducible cadaveric model of trochlear dysplasia by altering the trochlear groove in normal

cadaveric knees and then validate the model through both mechanical and radiographic measurements of the modified trochlea. We hypothesized that the radiographic indices of trochlear dysplasia in the osteotomized femurs will approximate those in dysplastic trochlea.

Methods: Eight fresh frozen cadaver knees were thawed in a refrigerator. Soft tissues were removed to the joint capsule, the extensor mechanism was preserved. A reverse trochleoplasty was performed on each of the specimens using inflatable bone tamps. Calibrated fluoroscopic merchant and true lateral images were obtained and trochlear depth measurements were repeated at 0, 20, and 40 degrees of flexion. The trochlear depth (TD) was then calculated as the average across the three measurements of the lateral femoral condyle height (LFCH) and the medial femoral condyle height (MFCH).

Results: In all but one case, TD decreased after reverse trochleoplasty. The average depth for the intact specimens was 3.59±1.36mm, 4.56±1.11mm, and 5.12±1.04mm at 0º, 20º, and 40º of flexion respectively. Reverse trochleaplasty lead to an average increase across all angles in trochlear floor height of 2.19±0.83mm. The mechanical measurements of trochlear depth were confirmed by fluoroscopic imaging. TD before RT was 6.93±1.30mm and 3.40±1.65mm after, with an average decrease in depth of 3.37±0.45mm (standard error, n=8). The average prominence across all specimens was 3.30±0.73mm before RT, and 5.51±1.53mm after RT. On average, prominence was increased by 1.95±0.55mm.

Discussion: This study confirmed our hypothesis that a dysplastic model can be achieved with reproducible success. This model may help further studies evaluating trochlear dysplasia and treatment modalities for it.

Notes:

12:38pm–12:44pm

Internet and Orthopaedic Surgery: The Prevalence and Value of Social Media in Orthopaedic Patients

Emily J. Curry, BA
Xinning Li, MD
Joseph Nguyen, MPH
Elizabeth Matzkin, MD

Introduction: Prior studies in other medical specialties have shown that social networking and internet usage has become an increasingly important means of patient communication and referral. However, this information is lacking in the orthopaedics literature. In this study, we evaluate the means by which new patients arrive at orthopaedic clinics in a major academic center. The purpose of this study is to evaluate the prevalence of Internet or social media usage in new patients referred to a major academic orthopaedics center and to identify new avenues to optimize patient recruitment and communication.

Methods: New patients were recruited in a major academic orthopaedic clinic to complete a 15-item questionnaire with demographic information, social media use/networking, educational background, distance traveled, utilization of physician review sites and referral method. Data was collected for all orthopaedic sub-specialties and analyzed accordingly. Statistical analysis was performed.

Results: Of the 752 responses, there were 66% female and 34% male responses. Responses were obtained from hand (142), sports medicine (303), foot and ankle (129), joints/tumor (95) and trauma (83) services. Overall, 51% report using social networking sites such as Facebook or Twitter. Of the patients that report not using social network sites, 92% are over the age of 40. Joints/tumor patients most commonly had seen another orthopaedic surgeon prior to their visit (59%) and had prior surgery (42%). Most patients traveled under 60 miles and were referred by their primary care physicians. Between 18-26% of all patients used a physician review website before consultation. The majority of the patients prefer communicating with their physician via the phone (68%) compared to email (32%). Independent associations found that sports medicine patients tend to be higher social networking users (35.9%) relative to other services (9.8-17.9%) and was statistically higher when compared to the joints/tumor service (P<.0001).

The multivariate logistic regression model showed that the sports service was generally more likely to have social networking users with the exception of the foot/ankle service), however these differences were not statistically significant. The biggest indicator predicting social media usage in the orthopaedic population was age. The older the patient population, the less likely patients will use social networking sites. Non-doctorate patients were more likely to be social media users compared to doctorate level individuals, but was not statistically significant. Patients that lived from 120 to 180 miles from the hospital were significantly more likely to be social media users, as were patients that did research on their condition prior to their new patient appointment.

Discussion and Conclusion: Orthopaedic patients who use social media are more likely to be younger, research their condition prior to their appointment and undergo an average day's travel (120-180 miles) to see a physician. Up to 26% of all patients have seen or used a physician review site prior to their visit. Despite the increased social media usage, most orthopaedic patients still prefer telephone communication with their physicians. Overall, social networking and internet may be an effective way for surgeons to recruit a wider patient population. In an increasingly competitive market, surgeons with younger patient populations (Sports Medicine) will need to utilize social networking and the internet to capture new patient referrals.

Notes:

12:44pm–12:50pm

Characterization of Acetabular Articular Cartilage Dimensions Using Reformatted MRI

Stephanie Pun, MD
Andreas M. Hingsammer, MD
Young-Jo Kim, MD, PhD

Introduction: Assessment of acetabular articular cartilage size is important prior to performing acetabular rim-trim for pincer femoroacetabular impingement (FAI). Improvements in image processing have enabled us to characterize the true dimensions of the acetabulum in parallel and orthogonal planes to the opening of the acetabulum. The aim of this study was to use reformatted MRI sequences to establish the dimensions of normal, dysplastic, and deep acetabula.

Methods: IRB approval was obtained to retrospectively review MRI's of symptomatic hips with acetabular dysplasia or pincer FAI, and pelvic CT scans of asymptomatic control hips. Each group consisted of 20 skeletally mature patients (10 female, 10 male). Superior lunate cartilage width (SLCW) and cotyloid fossa height (CFH) were measured on coronal reformats; anterior lunate cartilage width (ALCW), posterior lunate cartilage width (PLCW), and cotyloid fossa width (CFW) were measured on axial reformats. Average lunate cartilage and cotyloid fossa dimensions, and ratios of lunate cartilage to cotyloid fossa size were compared between the three cohorts. Statistical analysis was performed with multivariate ANOVA and Bonferroni's adjustment for multiple comparisons.

Results: Dysplastic acetabula were significantly globally smaller than control and pincer acetabula. Pincer acetabula were only significantly larger than control acetabula in the anterior (ALCW) and posterior (PLCW) lunate cartilage dimensions. A subgroup of pincer acetabula had a significantly larger cotyloid fossa and significantly smaller superior (SLCW) cartilage size than controls.

Discussion and Conclusion: Surgical treatment of pincer FAI may be guided by theamount of lunate cartilage available for resection. If the lunate cartilage is large, then acetabular rim-trim to create an articular surface of normal size is possible. If the lunate cartilage is small, a reverse periacetabular osteotomy that reorients yet preserves the size of the articular surface may be more appropriate. Understanding acetabular articular cartilage size will help to determine appropriate surgical intervention.

Notes:

12:50pm–12:56pm

Radiographic and Clinical Results of Revision Limb Salvage After Removal of Compression Osseointegration Implant

Raffi Avedian, MD
Geoffrey Abrams, MD
David G. Mohler, MD

Introduction: Limb salvage endoprosthetic implants eventually require revision due to complications including infection, aseptic loosening, local recurrence, and peri-prosthetic fracture. Bone loss due to stress shielding, osteolysis, and erosion can make it difficult to perform revision surgery. In patients who have compression osseointegration implants and require revision, it is thought that, in spite of implant failure, the quality of the bone at the implant interface remains strong and the bone loss associated with implant removal is low (Figure 1). These may be significant advantages over stemmed implants; however no one has ever quantified or reported on these factors. The purpose of this study was to determine if revision of a compression osseointegration implant is associated with preservation of bone stock and ease of endoprosthesis reimplantation. We specifically asked: (1) What is the quality of bone at the implant interface when a compression osseointegration implant has failed and needs to be extracted? (2) How much bone loss results during extraction of the implant? (3) What are the clinical and radiographic outcomes of the revision reconstruction?

Method: We conducted a retrospective chart review to identify patients who had undergone a limb salvage surgery from 2002 to 2011 with a compression osseointegration implant and underwent a subsequent revision surgery. Patient variables including demographics, age, sex, diagnosis and previous surgical details were recorded. Radiographic outcomes were determined by analyzing, in a blinded fashion, standardized anteroposterior and lateral radiographs that were taken at standard intervals including before and after surgery, and 6 weeks, 12 weeks, 6 months, and 1 year after surgery. Measurements were corrected for magnification. We measured the quality of bone at the level of the spindle sleeve using the cortical thickness index described by Dorr and colleagues. We did not measure cortical width at the interface because bone growth typically occurs in this location which would skew the results. We compared the cortical thickness index immediately after primary surgery and immediately prior to revision surgery to determine the change in bone quality. Radiographic stability and osseointegration of the revision implant was defined as 3mm of bone hypertrophy at the implant bone interface as described by Avedian et al. for compression implants and the Harris criteria were used for cemented stems. Minimum follow-up was 2 years unless osseointegration, implant failure, or patient death occurred prior. Bone loss defined as linear shortening of bone resulting from extraction of the implant was measured as the length from a reference point on the native joint to the cut end of the bone on standardized radiographs. Clinical results were reported using the 1993 Musculoskeletal Tumor Society Functional Outcome score.

Results: After review of our institutional database, we identified 51 cases of endoprosthetic limb salvage surgery using compression osseointegration. Ten patients underwent revision surgery of whom 2 patients received cemented stemmed implants and 8 received a new compression implant. The reason for revision was infection in seven patients and aseptic loosening in three. Average follow-up was 36.0 months (range 3-108 months). The mean change in the quality of bone from primary surgery to time of revision as measured by the change in cortical thickness index was 0.04 (95% CI, 0.028-0.052). The median bone loss at time of revision was 3 mm (range 2 mm-80 mm). All subsequent revision implants were stable at latest follow-up. The average preoperative and postoperative MSTS scores were 21.3 (range 18-23) and 26.6 (range 25-29) respectively.

Conclusion: Based on the results of this study we conclude that patients with compression osseointegration implants that require revision surgery either for infection or aseptic loosening will likely have bone quality and stock similar to their first surgery. A weakness of this study is that determining quality of bone is more complex then then the criterion we used of cortical thickness. Bone mineral density, vascularity, and metabolic state are important variables that were not addressed in this study. However, all patients underwent successful revision and their MSTS functional scores improved. Very little is reported in the orthopaedic literature regarding the details and outcomes of revision limb salvage surgery. Revision endoprosthetic reconstruction after failed compression device limb salvage may be easier than revision of stemmed implants because of the ease of removal of the compression implant and the quality and quantity of bone remaining for reconstruction. These factors may translate into improved clinical outcome however more research with a larger number of patients and direct comparison between treatment groups is necessary to gain a better understanding of this important topic.

Notes:

12:56pm–1:02pm

Why Go Wide? Outcomes of Marginal Surgery in Atypical Neurofibroma and Low-Grade MPNST

Nicholas M. Bernthal, MD
*Jared Niska, MD
Angelica Putnam, MD
David Viskochil, MD
Kevin C. Jones, MD
R. Lor Randall, MD

Background: While malignant peripheral nerve sheath tumors (MPNST) are among the most aggressive soft tissue sarcomas and benign plexiform neurofibromas pose no metastatic threat, little is known about the natural history of the intermediate nerve sheath lesions: atypical neurofibroma and low-grade MPNST. The present investigation is the first dedicated to the clinical outcomes of atypical neurofibroma and low-grade MPNSTs exclusively. The study also reviews the impact of negative surgical margins on survival and local recurrence in these lesions.

Methods: Retrospective review of 23 consecutive patients with surgically treated atypical neurofibroma (N=11) and low-grade MPNSTs (N=12) at a pediatric hospital between 1998 and 2012. Patients with less than one year clinical follow-up were excluded. Clinical outcomes including patient survival, presence of metastatic disease, and local recurrence were reviewed. Histology was re-reviewed to confirm diagnosis and classify surgical margins. Statistical comparisons were performed using two-tailed t-test.

Results: Twelve patients with low-grade MPNST and eleven patients with atypical neurofibroma were identified. Median age at time of surgery was 14 years old (range 2-21) and 52% (12/23) of patients were female. Median follow-up was 47 months (range 14-198 months). Nineteen of 23 patients carried an underlying diagnosis of neurofibromatosis type 1 (NF1). Nineteen of 23 patients had positive margins (R1 or R2) on resection, with an additional three showing plexiform neurofibroma at the surgical margin. Six patients underwent re-resection – three immediately after surgery for "positive margins" and three distantly for painful recurrence (2 low-grade MPNST, 1 atypical neurofibroma). Zero patients died of metastatic MPNST.

Discussion: This is the first study dedicated to clinical outcomes in exclusively "intermediate" nerve sheath tumors – low-grade MPNST and atypical neurofibroma. In a series in which 19 of 23 patients with intermediate nerve sheath tumors – 11 atypical neurofibromas and 8 low-grade MPNSTs – had frankly positive surgical margins that were treated with observation, none has died of metastatic MPNST. While further studies are needed, this suggests that wide surgical margins may not be necessary for intermediate nerve sheath tumors and may carry unnecessary surgical morbidity.

Notes:

1:02pm–1:08pm

Incidence and Implications of Intra-Articular Radial Head Fractures in the Pediatric Patient

Ryan R. Fader, MD
Frank Scott, MD
Richard Ackerson, MD
Patrick Carey, BS

Purpose: Intra-articular radial head (IARH) injuries are known to have devastating consequences in adults, but are much less recognized in pediatric patients. Through retrospective data collection this study aims to identify the incidence of IARH fractures while identifying particular trends, outcomes, and complications associated with these injuries in children.

Methods: Current-Procedural Terminology (CPT) codes were used to identify patients presenting with IARH and radial neck fractures between 2003 and 2011 from an electronic medical record database. The relative incidence of IARH fractures was recorded. Demographic variables were obtained along with fracture type, treatment method, complications, need for physical/occupational therapy and subsequent surgery. Mid-P exact tests and logistic regression analyses were used to compare the incidence of complications, need for physical therapy (PT) and need for revision surgery between the intra- and extra-articular fracture groups.

Results: 311 patients with radial head and neck fractures were identified. 299 (96.14%) were extra-articular and 12 (3.86%) were intra-articular. Mean age at time of injury was 11.46 (±3.09) and 8.32 (±3.31) years for intra- and extra-articular injuries, respectively. The incidence of complications was significantly higher in the IARH group with 60 per 100 [95% CI: 21.91-130.6], in contrast to 1.34 per 100 in the extra-articular fracture group. A significantly greater proportion of the IARH fractures also required surgery (25% intra-articular vs. 0%, extra-articular) and physical therapy (50% intra vs. 19.59% extra-articular).

Discussion and Conclusion: This study comprises the largest known sample size of pediatric radial head and neck fractures. This cohort demonstrates significantly higher rates of complications, need for physical therapy and/or revision surgery in IARH fractures as compared to their extra-articular counterparts. The significant complication rate associated with pediatric IARH fractures necessitates an increased awareness of this fracture pattern to direct necessary diagnostic and treatment modalities.

Notes:

Thursday, July 31, 2014

Concurrent Session 4 — Pediatrics

Moderator: Howard Epps, MD

12:20pm–12:26pm

Diagnosis of DDH by Ultrasound Screening in Infants with Risk Factors

Thu-Ba Leba, MD
Kelly D. Carmichael, MD
Leonard E. Swischuk, MD

Introduction: Developmental dysplasia of the hip (DDH) is a common hip disorder in infants. Early diagnosis would allow early treatment and, thus, avoidance of the development of persistent deformity and degenerative joint disease. However, the best screening method is controversial. While ultrasound (US) is a sensitive modality for detecting DDH, studies have suggested that cost-effectiveness issues limit its use for screening. We assessed whether the effectiveness of US screening would increase if its use was targeted to infants with risk factors (RF) for DDH and a negative physical examination.

Methods: The radiologists' reports on all US scans made at our institution from 2007 to 2011 for DDH were reviewed. In each case, both static and dynamic US scans were made. The records of infants with RF for DDH (e.g., female, breech presentation, first born, positive family history) and a negative physical examination performed by an orthopedic faculty member or a pediatrician were selected for analysis. The study was approved by our institution's IRB.

Results: US for DDH was performed in 515 patients during the reviewed time period. Forty- four percent had RF for DDH and a negative physical examination. Mean age of the 225 patients selected was 6.9 weeks; 85% were female, 77% had breech presentation, 25% were first born, and 3% had a family history of DDH. Seventeen had instability by dynamic US evaluation, for a 7.6% incidence of DDH. Instability occurred on the left side in 10 patients, on the right side in 4, and bilaterally in 3. All 17 patients were treated with Pavlik harnessing.

Discussion and Conclusion: Our results suggest that selective US screening for DDH in infants with risk factors and a negative physical examination may be effective, as it changed management in almost 8% of patients with both findings. Analysis of cost-effectiveness is needed.

Notes:

12:26pm–12:32pm

All Lateral Versus Medial and Lateral Flexible Intrameullary Nails for the Treatment of Pediatric Femoral Shaft Fractures

J. Matthew Cage, DO
Sheena Black, MD
Anthony Riccio, MD
Lane Wimberly, MD

Introduction: Multiple techniques for flexible intramedullary fixation of pediatric femur fractures have been described. To our knowledge, no study comparing medial and lateral entry versus all lateral entry retrograde nails has been reported. The purpose of this study is to compare surgical and radiographic outcomes and rates of symptomatic hardware removal between these techniques.

Methods: An IRB approved, retrospective review of patients treated by retrograde, dual flexible intramedullary fixation of femur fractures was performed at a pediatric hospital between the years 2009-2012. Demographics, blood loss, and operative time were collected from the medical and surgical record. We assessed radiographs for fracture pattern, time to union, and canal fill as well as shortening, and angulation at the time of osseous union. Rates of symptomatic hardware and hardware removal were noted. Data was compared between patients treated with all lateral entry nailing and those treated with medial and lateral entry nailing using the Student's t-test

Results: 131 children with femoral shaft fractures were treated with retrograde flexible intramedullary fixation using Ender's stainless steel nails (Richards). 45 were treated with two lateral entry nails and 86 were treated with one medial and one lateral entry nail according to surgeon preference. There were no statistical differences in gender, age, weight, body mass index, blood loss, and fracture pattern between the two groups. The average total anesthesia time was 27 minutes faster in the lateral group. There was no difference between the two techniques in shortening or coronal angulation at union regardless of fracture pattern. In comminuted fractures, the lateral nails demonstrated less sagittal angulation (0.4 degrees vs 3.2 degrees). In the lateral group, there was greater correlation between fill of the canal and reduced shortening at union. There was no statistical significance noted for shortening or angulation between entry types based upon weight. There is a trend for increased symptomatic hardware removal in the lateral group (17.5% versus 11.0%) but no correlation between symptomatic hardware and BMI in either group. There were no iatrogenic neurologic injuries, infections, clinically significant malunions, non-unions, or refractures.

Discussion and Conclusion: Medial and lateral versus all lateral retrograde flexible nails in femur fractures demonstrate comparable fracture stability and safety. The all lateral technique is potentially a faster procedure. Neither technique demonstrated a clinically significant difference in rates of shortening, angulation, or symptomatic hardware.

Notes:

12:32pm–12:38pm

Treatment of Stable Pediatric Elbow Fractures with a Long Arm Gauntlet Cast

Byron H. Izuka, MD
Krister P. Freese, MD

Introduction: Pediatric elbow fractures are among the most commonly encountered fractures for pediatric orthopedic surgeons. Many of these injuries are stable and do not require operative intervention. Traditionally, stable fractures have been treated with a long arm cast that includes immobilization of the wrist. In our study patients were treated with a gauntlet cast, a long arm cast that ends proximal to the ulnar styloid. The aim of our study is to determine if gauntlet casting of stable elbow fractures provides satisfactory clinical and radiographic outcomes.

Methods: A retrospective review of prospectively collected data was performed. Consecutive patients between September 2010 and September 2012 with stable elbow fractures treated with a gauntlet cast were included in the study. Charts were reviewed to determine demographic data, fracture type, mechanism of injury, time of follow up, duration of immobilization, complications from treatment and final clinical outcome.

Results: 124 patients were included and no patients were lost to follow up. The average age of the patients was 5.7 years old. There were 66 males and 58 females. The most commonly treated fracture types were supracondylar humerus (62.9%), olecranon (13.7%), and radial neck (12.9%). The average time of immobilization was 26.6 days. The average follow up was 31.8 days. 121 patients had full elbow range of motion at final follow up. There were 5 minor complications. The most common complication was skin irritation adjacent to the ulnar styloid. All patients went on to near anatomic fracture union, were pain free, and had near full range of motion.

Conclusion: The treatment of stable pediatric elbow fractures with a long arm gauntlet cast results in excellent clinical outcomes. In our experience this form of treatment leads to high patient and parental satisfaction.

Notes:

12:38pm–12:44pm

The Effects of Restraint Type on Pattern of Spine Injury in Children

Justin Ernat, MD
Jeffrey Knox, MD
Lane Wimberly, MD
Anthony Riccio, MD

Introduction: While the use of appropriate vehicular restraints has reduced the overall morbidity and mortality of children involved in motor vehicle collisions (MVC), no study to our knowledge has examined the relationship between restraint type and patterns of pediatric spinal injuries. The purpose of this study is to evaluate the association between vehicular restraint type and injuries sustained to the spine in a pediatric population following motor vehicle collisions.

Methods: We completed an IRB approved, retrospective chart review of all patients presenting to a level 1 pediatric trauma hospital with spine injuries sustained in motor vehicle collisions from 2003-2011. We restricted our study population to patients less than 10 years of age, as it has been shown that older patients have patterns of injury similar to adults. We reviewed pre-hospital data for restraint type and reviewed the medical records and radiographs to characterize the spinal injuries sustained.

Results: 97 patients were identified with spinal trauma secondary to MVC with appropriate documentation of restraint type. Car seat/booster seat (C/B) patients sustained significantly higher rates of upper cervical (C) spine (62%) and ligamentous (62%) injuries than the two-point (2P) (10%) and three-point restraint (3P) (24%) groups. In contrast, 2P and 3P restraint use was associated with significantly higher rates of thoracolumbar injuries (67% and 62%, respectively) than the C/B (14%) and unrestrained (UR) (0%) groups. 2P and 3P passengers also had a higher rate of flexion-distraction (F/D) injuries. The patients in the UR group sustained a significantly higher rate of C-spine (80%) and ligamentous (40%) injuries than the 2P and 3P groups. No significant differences were found in the type or location of injury between the 2P and 3P groups. Significant differences in proper restraint use was also found between age groups with younger children demonstrated higher rates of proper restraint use than older children.

Conclusions: Two or three-point seatbelt use is associated with lower rates of cervical spine trauma but higher rates of thoracic and lumbar trauma, particularly flexion-distraction injuries when compared to car or booster seats. Children in car seats/booster seats and those who are unrestrained sustain high rates of cervical spine injury.

Notes:

12:44pm–12:50pm

A Comparison of Pin Configurations in Pediatric Distal Tibia Fractures: A Biomechanical Analysis

Jeffrey Jobe, MD
*Aditi Majumdar, MS
Justin Brantley, BS
Antony Kallur, MD
Christina Salas, MS

Introduction: Percutaneous pin fixation concurrent with cast immobilization has been described as a closed reduction technique for the treatment of pediatric long bone fractures. This study was the first to investigate the optimal pin configuration for stabilization of pediatric distal tibia fractures of transverse morphology when exposed to torsional and bending stresses.

Methods: Fifteen synthetic composite tibias with a simple transverse distal metaphyseal fracture (25 mm proximal to distal articular surface) were reduced and fixed with two 3.2mm K-wires in 1 of 3 pin configurations: two parallel configurations (Group 1 initiating through the medial malleolus and Group 2 initiating through the diaphysis proximal to the fracture) and one cross configuration (Group 3). A servohydraulic-testing machine was used to investigate torsional and bending stiffness as a measure of bone/implant construct stability.

Results: A significant difference in stiffness was observed between parallel specimens (Group 1 vs 2) when subjected to external rotation. Cross configuration (Group 3) specimens demonstrated significantly greater stiffness in internal rotation than Group 2 specimens. No significant difference was found between Group 1 and Group 3 specimens in external or internal rotation. In the medial-directed bending test, Group 2 and Group 3 demonstrated significantly greater stiffness than Group 1. No statistical significance was found between groups for anterior-, posterior-, or lateral-directed bending loads.

Discussion and Conclusion: Results yield no single construct to be superior when considering bending and torsional stability. Yet, given the operative and anatomic challenges of administering a cross-pin configuration, the parallel configuration through the medial malleolus may be clinically optimal for providing torsional stability. The cross-pin configuration can then be reserved for fractures prone to varus malalignment. This study provides insight to the torsional and bending stability of three clinically viable pin configurations.

Notes:

12:50pm–12:56pm

Adult Function After Limb Lengthening or Amputation in Childhood for Congenital Limb Deficiency

Jennette L. Boakes, MD
Alexis Gaskin, MD
Anita Bagley, PhD

Introduction: The purpose of this study was to determine how adults function after having leg lengthening or amputation in childhood for congenital limb deficiencies. There are no long term functional outcome studies which can help parents make difficult treatment decisions which must be made when their child is very young.

Methods: Patients who had femoral or tibial lengthening OR amputation in childhood for congenital limb deficiency were included if they were at least two years post-op and no further surgeries were planned. These measures were collected: SF-36 Quality of Life health questionnaire, Body Composition, Muscle Strength, O2 Consumption, Walking Speed, and Step Activity Monitor (SAM).

Results: 13 patients, 18-27 years old completed the testing. The average SF36 score for both groups was normal for age. Lengthening patients had higher than recommended percent body fat of 39%. Both groups had weak quadriceps. Amputee's affected side was 62% as strong as their normal side, and lengthening group was 50% as strong. The energy cost of Amputee walking was 0.33 ml O2/kg/m which was almost 3 times more than the lengthening group at 0.13 ml O2/kg/m. Both groups walked slowly with Amputee walking speed 45 m/min, and Lengthening walking speed 59 m/min. (normal is 80 m/min). Amputees averaged 4609 steps/day and lengthening patients 2900 steps/day.

Discussion and Conclusion: These data show that both groups have significant functional impairment in young adulthood. Compared to Lengthening patients, we found that amputees were more active, stronger and had lower body fat, but they were slower walkers at a higher energy cost. This agrees with prior studies which have shown that using a prosthesis has a higher energy cost. Lengthening patients were weaker, had higher body fat, and scored lower on every other functional measure except their energy cost of walking which was close to normal. Both groups were quite sedentary, walking far less than the recommended 10,000 steps/day. Leg lengthening and amputations done in childhood can have a major impact on adult health, particularly as patients age and develop other comorbidities.

Notes:

12:56pm–1:02pm

Reoperation Rates After Minimally Invasive Muscle-Tendon Lengthening for Cerebral Palsy

David A. Yngve, MD
William K. Wilson, BS

Introduction: Selective percutaneous myofascial lengthening (SPML) refers to a group of techniques used for minimally invasive lengthening of muscle-tendon units in patients with cerebral palsy. The long-term outcomes are not well described. Our hypothesis was that there are acceptable reoperation rates following SPML.

Methods: A retrospective chart review was performed to identify all patients with cerebral palsy who between 2006 and 2011 underwent first SPML in the hip, knee, or ankle region at our institution. Data recorded included the performance of SPML reoperation.

Results: Follow-up after first SPML was from 1 to 6 years in the 516 patients identified. The reoperation rates were 11% overall, All reoperations were outpatient procedures. To determine rates according to age at initial surgery, the patients were grouped as 2 to 5 years of age (123 patients), 6 to 9 years (156 patients), 10 to 13 years (128 patients), and 14+ years (109 patients). The reoperation rates were 13% in patients aged 2-5 years, and 12%, 9%, and 8% for those aged 6-9, 10-13 and 14+ years, respectively. Reoperation rates according to age and hip, knee, or ankle region were studied. The reoperation rates were highest in the ankle region in the group of children aged 2 to 5 years (11%) and at the hip in the groups aged 6 and older (10%). The reoperation rates were lowest in the knee region in the group of children aged 6-9 (2%) and in the group aged 14+ (0%).

Discussion and Conclusion: There is a low reoperation rate following this minimally invasive outpatient procedure. There was little difference in reoperation rates when looking at different age groups.

Notes:

1:02pm–1:08pm

Pain Reduction in Non-Verbal Children with Cerebral Palsy Following Minimally Invasive Surgery and Ethanol Injections

Andrew G. Patton, MD
*David A. Yngve, MD
Aaron M. Gray, BA
Roy M. Nuzzo, MD
Matthew De La Cruz, BS
John D. Robinson, BS

Introduction: This study's purpose is to determine pain relief following minimally invasive interventions with myofascial lengthening, tenotomies, ethanol nerve blocks and ethanol hip injections in children with cerebral palsy (CP) and communication difficulties.

Methods: The study comprised 50 non-verbal patients with CP who underwent minimally invasive surgery between

May 2010 and September 2012. Age ranged from 2 to 19 years (mean 9.8 years). All children had few or no words. The Paediatric Pain Profile (PPP) was used to assess the child's pain, which was provided by the child's caregiver before and at least 1-year after surgery. The PPP is a validated 20-item questionnaire evaluating child behaviors (e.g., frequency of crying/moaning/groaning/screaming, frequency of disturbed sleep). Scores 14 or higher were considered indicative of significant pain. Analysis of cohorts was based on presence of significant pain preoperatively, severity of hip morphology and specific procedures performed.

Results: Thirty-five of 50 (70%) children had lower pain scores 1-year following surgery. Mean pain score was 18.3 preoperatively and 13.4 postoperatively. 25 of 31 children with significant pain (81%) showed improved pain scores, from 24.5 to 16.2. Eighteen of 20 questions showed a decrease in pain scores. Ten of 17 children with very poor hips (Acetabular Index of 30 and higher or Migration Percentage of 80 and higher) had intra-articular ethanol hip joint injections, with pain improvement in 9 patients. The Fisher Exact test showed correlation between hip injections and pain improvement.

Discussion and Conclusion: Minimally invasive techniques can decrease pain at intermediate follow-up in non-verbal children with cerebral palsy even in those with significant pain. Children with very poor hips showed no statistical decrease in pain scores except those patients who received hip injections. This suggests hip injections are crucial in controlling pain in children with high acetabular indexes and migration percentages.

Notes:

2014 Scientific Program Abstracts — Friday

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

Friday, August 1, 2014

Concurrent Session 6 — Sports Medicine

Moderator: John "Trey" Green III, MD

7:05am–7:11am

Predictability of Hamstring Tendon Autograft Diameter for Anterior Cruciate Ligament Reconstruction Based on Pre-Operative Magnetic Resonance Imaging

Thomas J. Kremen, Jr., MD
Miltiadis Zgonis, MD
Emily N. Vinson, MD
William Garrett, MD, PhD

Introduction: Hamstring tendon autograft (HTA) is a common graft source for anterior cruciate ligament (ACL) reconstruction. Recent literature suggests that HTA's below 8mm in diameter are associated with higher failure rates and poorer outcome scores. Currently, surgeons do not have a reliable user-friendly tool to predict eventual HTA diameter pre-operatively. Thus, we hypothesized that pre-operative pes tendon measurement on MRI would correlate well with intra-operative HTA diameter.

Methods: Pre-operative 3T MRI scans of 141 patients were measured retrospectively using an axial image located 3cm proximal to the posterior portion of the medial tibial plateau. Gracilis and semitendinosus tendon CSA was measured by a fellowship-trained musculoskeletal radiologist using the DOI tool provided with the standard General Electric PACS imaging software. The radiologist was blinded to the subsequent intra-operative diameter. A linear regression analysis comparing the total CSA (gracilis CSA added to semitendinosus CSA) as measured on MRI to the actual intra-operative HTA diameter was performed resulting in a model of best fit for the observed data. The probability of observing an intra-operative diameter value of 8.0mm or greater for each total CSA measurement was then calculated based on the assumption that this model is true.

Results: Total CSA correlated well with intra-operative diameter with a correlation coefficient of: R = 0.69. A pre-operative CSA measurement of 27mm or greater was associated with a greater than 95% probability that the intra-operative graft diameter would be 8mm or greater.

Conclusion: CSA as assessed on pre-operative MRI correlates well with intra-operative diameter of HTA for ACL reconstruction. A threshold value of 27mm or greater CSA on pre-operative MRI in this series had a greater than 95% probability of resulting in a HTA of 8mm of greater. Pre-operative HTA measurements may significantly contribute to a surgeon's graft choice recommendations and pre-operative patient counseling.

Notes:

7:11am–7:17am

Knee Flexion in Collegiate Baseball Catchers Wearing or Not Wearing a Knee Saver

Keith T. Ellison, MD
*Aaron M. Gray, BA
Brian A. Smith, MD

Introduction: MRI studies have shown increased risk for meniscal injury with deep knee flexion. We used motion analysis to evaluate knee flexion in baseball catchers wearing or not wearing a knee saver device advertised as able to decrease the degree of deep flexion.

Methods: Using a two-camera, 3D motion capture system, video recordings were made of 11 male collegiate baseball catchers performing defined maneuvers typical of their position while wearing or not wearing a knee saver. Reflective marker balls were placed on the hip (greater trochanter), knee (lateral condyle), and ankle (lateral malleolus) and ROM was captured by the cameras. Video analysis software was used to track and calculate knee joint angles frame-by-frame. Five trials were performed in each athlete with and without the knee saver for both the right and left sides, including two warm-up trials. Mean values for the knee flexion angles over the three data trials were calculated for a total of 22 knee pair measurements, and the differences between knee flexion with and without use of the knee saver were analyzed using a paired t-test.

Results: The change in knee flexion angle with the use of the knee saver ranged from a 5.33° increase to a 6.67° decrease compared with no device (average difference, 0.76 ± 3.8°). No difference in knee flexion angle was seen between conditions for all athletes considered together. In a subset of 11 trials with initial knee flexion angles higher than those in other players, the flexion angle significantly decreased with use of the knee saver. In the remaining subset of 11 trials with lower initial knee flexion angles, flexion angles with knee saver use increased (NS).

Discussion and Conclusion: The use of the knee saver yielded no consistent change in knee flexion angle when the analyses included all the baseball catchers.

Notes:

7:17am–7:23am

MRI Assessment of the Posterior Shoulder Capsule in Patients with Glenohumeral Internal Rotation Deficit (GIRD): Comparison to Controls

Grant H. Garcia, MD
Min Jung Park, MD, MMSc
Camilo Jaimes, MD
Laura Wiegand, MD
Nancy M. Major, MD
G. Russell Huffman, MD, MPH

Introduction: Glenohumeral internal rotation deficit (GIRD) is ascribed as the precipitating pathology in overhead throwing athletes that causes subsequent glenoid labrum tears and altered shoulder kinematics. To determine if a measureable difference in posterior shoulder capsule (PSC) thickness is present on MRI in patients with symptomatic GIRD.

Materials: A case control study was done on overhead athletes with GIRD (20 degree loss of internal rotation or greater compared to the non-throwing arm). For every case we included 2 controls, which were gender, age at MRI (within 5 years), and dominant extremity matched. 8 cases (median age: 20.6; range: 16.8-50.7 yrs) and 16 controls (Median age:24; range: 18.9-49.8yrs). The capsule was measured on axial images near to its insertion in the glenoid labrum. A single measurement (mm) was taken at the point where each reader believed it was thickest.

Results: The GIRD cases (7 male, 1 female) were actively engaged in sports as follows: baseball/softball (n=4), tennis (n=2) hockey (n=1) and swimming (n=1). The average degree of GIRD on physical exam was 33.25 (range: 25-50). The controls (14 males, 2 females) had arthroscopically confirmed SLAP tears and no GIRD in their dominant shoulder. The computed median PSC thickness was 2.3 (range: 2.0-3.3) in GIRD subjects and 1.4 (range: 1.0-2.7) in controls. The PSC was consistently thicker in subjects with GIRD versus controls, and the difference was significant for the computed and individual measurements. Agreement between observers was excellent (ICC=0.78). Intra-observer variability was also high (reader1: ICC=0.87 and reader 2: 0.58).

Discussion and Conclusion: In patients with GIRD, the posterior inferior capsule is significantly thicker using a standardized MRI measurement than in control patients without GIRD. This may aid in identification and treatment of these

athletes with stretching programs or surgical intervention, preventing worsening shoulder pathology in the future.

Notes:

7:23am–7:29am

3-D Modeling of Humeral Head Defects in Glenohumeral Instability: Clinical Implications of Lesion Morphology and the Glenoid Track Concept

Jaicharan Iyengar, MD
Kevin Jiang, MD
Dennis Kwon, BS
Evan Lustbader, MD
Christopher Ahmad, MD

Introduction: Three-dimensional (3-D) CT reconstructions accurately characterize humeral head lesions with respect to size, orientation and morphology. The "glenoid track" concept was introduced to identify bipolar bony lesions at risk of interfacing dynamically. To our knowledge, no studies have looked at the relevance of 3-D lesion morphology or validated the glenoid track concept with respect to clinical instability or treatment outcomes.

Methods: 3-D models were reconstructed from multi-planar CT scans and data analysis was performed using MIMICS software. Volumetric analysis was performed using a best-fit sphere model. The glenoid track was mapped to the humeral head by using 84% of the actual glenoid width extending from the medial margin of the rotator cuff.

Results: Thirty-three patients who were treated for glenohumeral instability underwent pre-operative CT scans with 3-D reconstruction. The mean humeral head lesion volume was 1452.7 mm3. There was no difference in humeral lesion volume, 2-D dimensions, morphology, width/depth ratio or vertical orientation between those who failed prior arthroscopic stabilization (n = 13) versus those who did not (n = 18). When the glenoid track was mapped to the lesion taking into account glenoid bone loss, 12 of 31 (38.7%) were engaging lesions. There was no difference in the incidence of glenoid track engagement between patients that failed previous arthroscopic stabilization (5/13, 38.4%) and those that did not (7/18, 38.9%). Patients who underwent coracoid transfer procedures (n=14) were compared to age-matched controls (n=15) who underwent arthroscopic stabilization. There was no difference in the incidence of glenoid track engagement (35.7% vs. 40.0%, NS) between these two groups. Humeral head volume was the only significant predictor of undergoing a coracoid transfer versus arthroscopic stabilization procedure (1925 mm3 vs. 988 mm3).

Conclusions: Glenoid track engagement did not correlate with failure of prior arthroscopic stabilization nor predict ultimate treatment in our clinical cohort of instability patients who underwent treatment. Humeral head lesion volume was significantly associated with undergoing a coracoid transfer procedure.

Notes:

7:29am–7:35am

Incidence of Meniscal Injury and Chondral Pathology in Anterior Tibial Spine Fractures of Children

Justin J. Mitchell, MD
Rebecca Sjostrom, MD
Alfred A. Mansour, MD
Bjorn Irion, MS
Jaime Stewart, MD
Armando F. Vidal, MD
Jason T. Rhodes, MD

Introduction: Pediatric avulsion fractures of the anterior tibial spine are injuries similar to anterior cruciate ligament injuries in adults. Sparse data exists on the association between anterior tibial spine fractures and injury to the meniscus or cartilage of the knee joint in children. This research presents a retrospective review of clinical records, imaging, and operative reports to characterize the incidence of concomitant injury in cases of anterior tibial spine fractures in children.

The purpose of this study is to better delineate the incidence of associated injuries in fractures of the anterior tibial spine in the pediatric population.

Methods: We identified 58 patients who sustained an anterior tibial spine fracture (ATSF) and met inclusion criteria for this study between 1996 and 2011. The subjects were separated by the McKeever classification into Type I, II and III fractures, and each of these were subclassified by associated injury pattern.

Results: 58.6% of children with an ATSF had an associated soft tissue or other bony injury. The most prevalent associated injuries were meniscal entrapment, meniscal tears, and chondral injury. Twenty nine percent of Type II injuries demonstrated meniscal entrapment, 33% showing meniscal tears. 7.41% demonstrated chondral injury. Forty eight percent of Type III fractures had entrapment, while 12% showed tears. 8% had a chondral injury.

Conclusion: A majority (58%) of displaced ATSF had either concomitant meniscal, ligamentous or chondral injury. This finding suggests that MRI evaluation is an important aspect of the evaluation of these injuries, particularly in type II and type III patterns. To date, this study enrolls the highest number of patients to evaluate the specific question of concomitant injuries in anterior tibial spine fractures in the pediatric population.

Notes:

7:35am–7:41am

Mental Health Medication Use Predictive of Poor Outcome After Femoroacetabular Impingement Surgery in a Military Population

Justin Ernat, MD
Daniel Song, MD
Sean Brugman, MD
John Tokish, MD
Gregory Lee, MD

Introduction: Femoroacetabular Impingement (FAI) is common cause of hip pain in young adults believed to lead to early osteoarthritis. Studies have shown good results with surgical interventions even in high-level athletes. With the high operational tempo in the military with the current conflicts in Afghanistan and Iraq, many patients serve multiple deployments under very stressful conditions. A study by Hoge et al. in 2004 showed that 29% of all military personnel screened positive for post-traumatic stress disorder (PTSD), depression, or anxiety after deployment to Iraq. Multiple studies in the trauma, spine, and hand literature have shown poor outcomes in patients with mental health diagnoses after surgery. To our knowledge, this is the only study to investigate the correlation of mental health medication use and outcomes in a surgical condition that is common amongst our active duty population.

Methods: A retrospective review of the S3 surgical database was performed for all active duty patients at one institution undergoing surgery for FAI between 2007 and 2011. The U.S. Army e-Profile system and the Physical Evaluation Board Liaison Offices of the Army were utilized to obtain return to duty information. Electronic medical records were reviewed for history of mental health medication use. A retrospective review of mental health medication use was also performed on all active duty patients who presented for the first time to the Fracture Clinic between April and May of 2010 for acute, minor, orthopaedic trauma. These patients served as our control group for military mental health medication use.

Results: A total of 109 U.S. Army patients who underwent FAI surgery were identified between 2007 and 2011. The average age at time of surgery was 30 with 76 males and 33 females. For all patients undergoing FAI surgery, 45% were on mental health medications. For the 18 patients that were unable to return to active duty and were boarded for medical

reasons, 83% were on mental health medications. For patients that returned to full active duty after surgery, 37% were on mental health medications. For our control group, of the 158 patients identified, 36 patients or 23% were on mental health medications. Mental health medication use was considered a statistically significant risk factor for medical discharge. The patient population undergoing FAI surgery was statistically significantly more likely to be medically discharged than those active duty patients presenting to the fracture clinic.

Discussion and Conclusion: Similar to the trauma, spine, and hand literature, patients using mental health medications had poorer outcomes after surgery for FAI. Interestingly, there was also a higher use of mental health medications in patients undergoing FAI surgery compared to our control group with acute, minor, orthopaedic injuries. With the increased mental health burden on our active duty patients and the correlation with poorer outcomes after surgery in an elective non-traumatic condition, more research and intervention will be required to better treat the mental health condition and identify strategies to minimize the effect it has on surgical outcomes.

Notes:

7:41am–7:47am

Platelet-Rich Plasma Treatment Improves Outcome for Chronic Proximal Hamstring Injuries in an Athletic Population

Ryan R. Fader, MD
Eric McCarty, MD
Omar Mei-Dan, MD
Shaun Traub, MD
Roger Nichols, MD
Justin J. Mitchell, MD
Michelle Roper, RN, CCP-E

Introduction: Chronic proximal hamstring tendinitis is a disabling condition with no documented treatment option providing consistent successful results. The purpose of this study was to evaluate efficacy of treatment of chronic proximal hamstring tendinitis with ultrasound guided platelet-rich plasma injections.

Methods: A prospectively collected retrospective review of 18 consecutive patients was performed. Outcome measures included a questionnaire with visual analog scale (VAS) for pain, history of injury and previous treatments. All patients received an injection of platelet rich plasma via ultrasound guidance by a single radiologist.

Results: Our patient population included 12 females and 6 males. The average age at the time of the injection was 42.6 years (19-60). Activities included running, biking, and swimming. The average body mass index of patients was 22.9 (17.2-30.2). The average time of chronic pain prior to receiving the first injection was 32.6 months (6-120). All patients had attempted other forms of non-surgical treatment prior to entering the study. The average pre-injection pain score was 4.6 (0-8). Six months after the injection, 10/18 patients had 80% or greater improvement. Overall, the average improvement was 63 % (5-100). The only complication was post-injection discomfort that resolved within seventy-two hours.

Discussion and Conclusion: Chronic hamstring tendinopathy is a debilitating condition due to pain limiting athletes' ability to play. For refractory cases, platelet-rich plasma injections are safe and show benefit in most patients for the treatment of chronic proximal hamstring injuries at the ischial tuberosity.

**The FDA has not cleared this drug and/or medical device for the use described in the presentation.* *(Refer to page 41).*

Notes:

7:47am–7:53am

Return to Sports in High Demand and Overhead Athletes After Arthroscopic Laterjet for Shoulder Instability

Xinning Li, MD
Austin Vo, MD
Guillaume Dumont, MD
Robert Parisien, MD
Nathan Orvets, MD
Laurent Lafosse, MD

Background: This is a higher failure rate after stabilization surgery for anterior shoulder instability in high-risk athletes. The purpose of this study was to evaluate the medium to long-term recurrence rate and return to sports after arthroscopic Latarjet procedure performed in high demand and overhead athletes

Methods: We retrospectively reviewed 47 patients (23 skiers, 3 rugby, 3 football, and 18 overhead athletes) who had a minimum follow-up of 5 years and participated in contact or overhead sports, and had an arthroscopic Latarjet procedure performed for shoulder instability by the senior author. We assessed the patients for recurrence of instability as well as their return to previous level of sports.

Results: There were no dislocations and only 1 patient (2%) had recurrent subluxations (total of 3 events) not requiring further surgery. Mean time for return to sports was 6.3 months, although 24 patients (51%) were able to return within 4 months or less. All competitive athletes were able to return completely to pre-injury levels. Overall, 90% of patients were able to return to complete or a near return to the pre-injury activity level.

Conclusion: The arthroscopic Latarjet procedure is a reliable long-term treatment option for shoulder instability in high-risk athletes participating in contact or overhead sports.

Notes:

Friday, August 1, 2014

Concurrent Session 7 — Total Hip

Moderator: Thomas C. Barber, MD

7:05am–7:11am

Factors Determining Discharge Destination for Patients Undergoing Total Joint Replacement

Behnam Sharareh, BS
*Ran Schwarzkopf, MD, MSc

Introduction: Discharge destination to skilled nursing facilities (SNF) following total joint arthroplasty (TJA) plays an important role in healthcare costs. While such facilities have the benefits of direct patient care and sustained physical therapy, it is estimated that $3.2 billion is spent annually on rehabilitation at such facilities after lower-extremity arthroplasty. It is thus imperative to determine which factors influence discharge to SNFs and if such factors can be used to minimize unnecessary long term post-operative hospital stay or SNF discharge as well as assist in preoperative planning.

Methods: A retrospective review of the medical files of patients who underwent total hip and total knee arthroplasty from October 2012 through June 2013 was performed. The first 50 consecutive patients who were discharged to a SNF were compared to the first 50 consecutive patients who were discharged to home with respect to various pre-operative, intra-operative, and post-operative factors.

Results: Patients discharged to SNFs had slower pre-operative get up and go scores (TGUG), lower pre-operative EuroQol-5 dimension (EQ-5D) scores, higher ASA physical classification scores, increased hospital length of stay, increased self-reported post-operative pain, and decreased physical therapy achievements.

Discussion and Conclusion: We believe the results of this study may indicate that a certain group of patients have an increasing likelihood to be discharged to a SNF following inpatient total joint arthroplasty. Understanding which patients are more likely to be discharged to a SNF prior to surgery will allow hospitals and surgeons to better prepare and educate their patients, as well as make better pre-

operative estimates on the total cost of the procedure for a patient based on the likelihood of a particular discharge destination.

Notes:

7:11am–7:17am

Impact of Chronic Kidney Disease Stage on Outcomes After Total Hip or Knee Arthroplasty

Raveesh D. Richard, MD
Brian F. Deegan, BS
Thomas R. Bowen, MD
Robert M. Perkins, MD
Jove H. Graham, PhD
Michael A. Foltzer, MD

Introduction: End stage renal disease and dialysis is commonly associated with poor outcomes following joint replacement surgery. This study aims to evaluate post-operative complications in patients with less advanced chronic kidney disease (CKD) undergoing total hip (THA) or knee arthroplasty (TKA).

Methods: Patients who underwent THA or TKA between 2004 and 2011 with stage 1, 2, or 3 CKD were retrospectively reviewed via an electronic medical record. We compared 377 stages 1-2 CKD patients to 402 stage 3 CKD patients.

Results: No significant differences in 90-day readmissions or revisions were found between the stages 1-2 and stage 3 CKD patient groups. For patients with stage 3 CKD, overall mortality was greater than patients with stages 1-2 CKD. The significant difference in mortality between the stage 1-2 vs. stage 3 groups persisted in the THA patients but not in the TKA patients. However, when adjusted for comorbid disease, there were no significant increases in joint infection, readmissions or early revision between patients with stages 1&2 CKD versus patients with stage 3 CKD. The overall incidence of infection was high (3.5%) but far less than reported for patients with end stage renal disease, dialysis, and kidney transplant.

Discussion and Conclusion: Patients with stage 1, 2, & 3 CKD may be exposed to a higher than expected rate of prosthetic joint infection (3.5%) following total joint arthroplasty. Patients with stage 3 CKD are at a higher risk of postoperative mortality in comparison to lesser stages of kidney disease.

Notes:

7:17am–7:23am

Implant Related Complications in Total Hip and Knee Arthroplasty

Michael R. Dayton, MD
Mark S. Tuttle, MD
Steven J. Morgan, MD

Introduction: An important variable in successful total hip (THA) and total knee (TKA) arthroplasty is implant choice. Implant usage patterns among individual surgeons may be characterized by single vendor system or rotating between several different implant products. This study evaluates the relationship of THA and TKA complications among patient groups at an institution where single implant versus rotating implants choices are used.

Methods: A single hospital retrospective review was performed of all complications recorded from THA and TKAs performed for primary osteoarthritis over a two year period (n=248). Data was drawn from an Institutional Review Board approved complication registry. All surgical cases were performed under the supervision of one of two surgeons, both of which annually perform over 100 total joint arthroplasty procedures. One surgeon utilized an individual implant vendor each for THA and TKA (n=38); the second surgeon regularly rotated among six different implant systems for THA and TKA (n=210). Complications reported were implant related, including intra-operative fracture and dislocation.

Results: Of 248 patients reviewed, 5 (2%) had a direct implant related complication. Among the complications, 1 (THA dislocation) occurred in the THA group where a single implant vendor was utilized. The remaining 4 complications occurred in both primary THA (2) and TKA (2) where a rotation of six different implant systems were employed. These consisted of intra-operative fractures: TKA; tibial plateau (1), femoral condyles (1), THA; acetabulum (1), femoral calcar (1).

Discussion and Conclusion: Results of this retrospective case review illustrate a higher number of intra-operative fracture complications when a variety of implant systems and instrumentation are employed for primary total joint arthroplasty. While these data do not conclusively implicate implant choice as a direct correlate to complications, the role of consistent single versus multiple implant and instrument utilization may allow decreased occurrence of implant related fracture.

Notes:

7:23am–7:29am

The Reliability of Modern Alumina Bearings in Total Hip Arthroplasty

Gwo-Chin Lee, MD

Introduction: Ceramic components clinical fractures in total hip arthroplasty (THA) are rare but nonetheless serious complication. As a result of continued improvements in ceramic material quality, manufacturing methods, and implant design made over the last 30 years the incidence of such failures has drastically. In this report we will examine the frequency of these ceramic component clinical failures in THA. In order to get a complete picture we contacted the largest supplier of these components, and they agreed to share their most recent data.

Materials: In the year 2000, the largest supplier of alumina ceramic bearings for orthopaedic applications, began a rigorous program of collecting clinical fracture data for all of its ceramic components. The clinical fracture data for the period of January 2000 to June 2013 are reported here, with a review of the material properties, historical component fracture trends, and relative risk of fracture associated with alumina THA bearings.

Results: The data reported is divided into two separate groups. The first one is the incidence of clinical fracture of *forte* material. This is the original material developed in the 1970's and optimized over the years. The overall clinical fracture rate of these alumina components is 0.021 percent, or 21 in 100,000 during the January 2000 to June 2013 time period. The second group is composed of components manufactured from their Alumina Matrix Composite, *delta*. The overall clinical fracture rate for these components is 0.0001% or 1 in 100,000. Almost 80% of these alumina bearing failures occurred within 36 months following surgery. Increasing femoral head diameter was associated with a substantially reduced risk of fracture.

Discussion: Alumina bearings used in modern THA implants are safe and reliable, with a very low risk of failure. Improvements in the materials, developments in the manufacturing, the introduction of the Alumina Matrix Composite and the trend to utilize larger diameter ball heads are likely to drastically reduce the concerns that have been in the mind of surgeons using ceramics in THA.

Notes:

7:29am–7:35am

Periacetabular Osteotomy to Antevert and Uncover the Hip in Pincer Femoroacetabular Impingement

Stephanie Pun, MD
Andreas M. Hingsammer, MD
Young-Jo Kim, MD, PhD
Michael Millis, MD

Introduction: Periacetabular osteotomy (PAO) can reorient the acetabulum to decrease pincer femoroacetabular impinge-

ment (FAI) caused by acetabular retroversion or global acetabular overcoverage. We describe the indications, surgical technique, and early results of PAO to antevert and reduce femoral head coverage in symptomatic hips with pincer FAI not amenable to arthroscopic treatment.

Methods: IRB approval was obtained to retrospectively review cases of pincer FAI treated with either 1) reverse PAO to decrease lateral and anterior femoral head coverage, or 2) anteverting PAO to correct acetabular retroversion. We collected WOMAC scores and radiographic measurements consisting of the lateral center edge angle (LCEA), Tönnis angle (TA), anterior center edge angle (ACEA), cross-over sign (COS), posterior wall sign (PWS), and ischial spine sign (ISS). Pre-operative and post-operative data were statistically compared using student t-test, Wilcoxon signed-rank test, and exact binomial sign test.

Results: From 2004-2012, 23 hips (10 left, 13 right) in 17 patients (12 female, 5 male) underwent reverse or anteverting PAO. Average follow-up was 24.6 months. In hips that underwent reverse PAO, femoral head coverage significantly decreased (LCEA 42.9 to 32.3, TA -9 to 0.5, ACEA 46.6 to 40.0). In hips that underwent anteverting PAO, radiographic signs of retroversion (COS, PWS, ISS) significantly decreased. Postoperatively, both groups exhibited significantly improved pain and function, with total WOMAC scores improving from 37.3 to 23 after reverse PAO, and from 28.8 to 6.09 after anteverting PAO.

Discussion and Conclusion: Reverse and anteverting periacetabular osteotomies provide clinical and radiographic improvement in patients with symptomatic pincer FAI secondary to acetabular over-coverage or retroversion. Reverse and anteverting PAOs are an especially useful and appropriate alternative to arthroscopy in complex pathomorphologies such as coxa protrusio with a small articular cartilage surface and acetabular retroversion with borderline dysplasia.

Notes:

7:35am–7:41am

Hip and Knee Osteoarthritis in Patients with Non-Insulin-Dependent Diabetes Mellitus (NIDDM)

Laurie L. Jansky, MS
Zbigniew Gugala, MD, PhD

Introduction: A single recent study indicated that NIDDM may be an independent risk factor for developing major joint osteoarthritis (OA). Our objectives were to retrospectively determine prevalence NIDDM in patients who underwent total knee (TKA) and total hip arthroplasty (THA) for OA; associate NIDDM duration, course, and complications with hip and knee OA; and assess risk for developing hip and knee OA in the duration of NIDDM.

Methods: We reviewed the charts of 500 consecutive patients who underwent THA or TKA at our institution from 2008-2013. Exclusion criteria were arthroplasty due to fracture, post-traumatic arthritis, rheumatoid arthritis, avascular necrosis, and revision arthroplasty. Data were analyzed using descriptive statistics (multiple regression, t-test).

Results: 137 THA and 223 TKA patients were included in the study, and 26 (18.3%) and 54 (24.2%) of them had NIDDM. Adjusting for BMI, the study results indicated NIDDM as a risk factor independent of obesity for developing hip or knee OA. Despite acceptable glycemic control (HbA1c less than 9) in most patients, hip or knee OA requiring arthroplasty developed in average within 9.17 and 10.04 years of NIDDM duration, respectively. NIDDM was associated with 1.4 and 1.5 times higher rates of bilateral OA and other joint arthroplasty, respectively. Peripheral neuropathy was present in 42.3% of THA and 18.6% of TKA NIDDM patients.

Discussion and Conclusion: NIDDM is highly prevalent in the THA and TKA patient population and is strongly associated with bilateral OA. NIDDM appears to be an independent risk factor for developing severe hip and knee OA requiring arthroplasty. Impairment of sensory innervation may be a significant contributory factor in developing severe hip and knee OA. The high prevalence of diabetes among THA and TKA patients (overall 21.2%; 18.3% and 24.2%, respectively) mandates that an arthroplasty surgeon be familiar with the management of NIDDM patients.

Notes:

7:41am–7:47am

Proximal Femur Fracture with a Second Generation Tapered Hip Stem

Paul M. Lichstein, MD
Michael Bloomfield, MD
Claudio Diaz-Ledezma, MD
Matthew Austin, MD
Richard H. Rothman, MD

Introduction: Proximally coated tapered-wedge stems are frequently used in primary total hip arthroplasty (THA). Recent investigations into the three-dimensional morphology of the proximal femur have been utilized for the development of a second-generation stem with tapers that better accommodate the native geometry to establish a bone-implant interface in multiple dimensions. Although intraoperative fracture of the proximal femur is an infrequent occurrence during primary THA, increased fit and fill with this stem design may incur an increased risk of fracture during implantation The purpose of this study was to investigate the incidence of intraoperative proximal femur fracture with a first- and second-generation proximally coated tapered-wedge femoral stem.

Methods: The medical records and postoperative radiographs of consecutive cohorts of 344 THAs utilizing a first-generation stem and 369 THAs with a second-generation stem implanted between 1/5/2009 and 9/18/2012 were reviewed. Intraoperative fracture was determined by description in the operative report or by the presence of a non-prophylactic cerclage cable to prevent fracture propagation. Patient demographics and baseline characteristics were recorded, and the proximal femoral morphology was evaluated by the canal flare index (CFI).

Results: There were 7 (2.03%, 95% CI 0.82-4.15) calcar fractures in the first-generation cohort with average CFI 3.31 (range 2.31-4.78). There were 166 males and 178 females who received a first-generation stem with average BMI 28.3 (range 16.8-45.5) and average age 63.0 (range 29-88). There were 8 (2.17%, 95% CI 0.94-4.23) fractures in the second-generation cohort with average CFI 3.37 (range 2.5-4.5). There were 190 males and 158 females who received a second-generation stem with average BMI 27.8 (range 16.1 – 47.5) and average age 62.3 years (range 39-87). There was no statistical difference between groups.

Discussion and Conclusion: An improved understanding of the geometry of the proximal femur and appreciation of the medial implant curvature has facilitated the development of a second generation proximally coated wedge that maximizes bone-implant interface in multiple dimensions. However, the increased fit and fill with this stem design may incur an increased risk of fracture during implantation. Past investigations have revealed a 2.95-27.8% incidence of intraoperative proximal femur when utilizing a cementless construct. The purpose of this study was to investigate the incidence of intraoperative proximal femur fracture with a first- and second-generation proximally coated tapered-wedge femoral stem. Canal flare index (CFI) was utilized to ensure consistency in morphology between groups. Despite the increased geometric volume and increased metaphyseal fit and fill of a second-generation tapered-wedge femoral stem, we did not observe an increased incidence of fracture of the proximal femur during implantation.

Notes:

7:47am–7:53am

Arthroscopic Surgical Outcomes of Mild Dysplasia Versus Focal Pincer Femoroacetabular Impingement: A Multicenter Case Control Study

Dean K. Matsuda, MD
Raoul J. Burchette, MA, MS
Joshua Sampson, MD
Monti Khatod, MD
Nicole A. Matsuda

Introduction: Dysplasia and focal pincer impingement commonly occur with cam femoroacetabular impingement (FAI) but no studies have investigated comparative arthroscopic outcomes. The purpose of this study is to determine comparative outcomes in this setting.

Methods: A multicenter retrospective review of prospectively collected data was performed comparing a mild dysplasia cohort consisting of 7 patients (4 female) of mean age 38.4 years with a focal pincer cohort consisting of 78 patients (40 female) of mean age 51.3 years in patients with cam FAI

that underwent arthroscopic surgery between March 2009 and June 2010 with successful completion of pre-and post-operative nonarthritic hip score (NAHS) and 5-point Likert satisfaction instrument with minimum 2 year follow-up. Complications, revision surgeries, and conversion arthroplasties were recorded.

Results: The dysplasia cohort had a mean change in NAHS of +16.8 at 3 months, +11.7 at 12 months, and -2.3 at 24+ months. Mean satisfaction was 2.7. There were no complications, no revision surgeries, and 2 conversion arthroplasties (29%). The focal cohort had a mean change in NAHS of +12.7 at 3 months, +21.8 at 12 months, and +22.4 at 24+ months. Mean satisfaction was 3.7. There was 1 complication (1.3%), 1 revision FAI surgery (1.3%) and 8 conversion arthroplasties (10.3 %). Regression comparison based on group membership, predictive regression equation, and nested case control analysis confirmed poorer outcomes with the dysplasia cohort. The dysplasia cohort demonstrated significantly less improvement in NAHS and trends toward less satisfaction and higher arthroplasty conversions than the focal cohort.

Discussion and Conclusion: This is the first study to investigate outcomes from arthroscopic surgery for dysplasia in the common setting of concurrent cam FAI. Compared to patients with focal pincer FAI, patients with mild dysplasia have poorer outcomes following arthroscopic surgery. Moreover, early clinical improvement tends to quickly deteriorate in these patients.

Notes:

Friday, August 1, 2014

Concurrent Session 9 — Trauma

Moderator: David H. Chafey, MD

1130am–11:36am

Acute Upright Radiographs of Acute Clavicle Fractures Reveal Increased Displacement and Deformity

Justin B. Ledesma, MD
Michael Githens, MD
Julius A. Bishop, MD

Introduction: There is increasing recognition that a subset of patients with significantly displaced clavicle fractures benefit from surgery. While there are no absolute indications for surgery in a closed and isolated diaphyseal fracture, displacement and shortening influence decision making. The purpose of this study was to compare fracture displacement on supine versus upright radiographs obtained in the acute post-injury period.

Methods: Retrospective review of the orthopaedic trauma database at our institution over a 2 year period revealed 31 patients with acute diaphyseal clavicle fractures evaluated with supine and upright radiographs within 3 days of injury. Vertical translation, shortening or distraction, percent vertical displacement and angulation were measured on both supine AP radiographs and upright AP radiographs.

Results: Fracture shortening and vertical translation increased significantly on upright versus supine radiographs. Shortening measured on upright radiographs was 75% greater than measured on supine radiographs while vertical translation was 57% greater on upright radiographs. Angulation was similar between radiographs.

Discussion and Conclusion: Upright radiographs reveal significantly more shortening and vertical translation than supine radiographs in the setting of acute diaphyseal clavicle fracture. Upright imaging facilitates early recognition of fractures with radiographic features that may benefit from surgery. We recommend that upright x-rays be obtained routinely as part of the radiographic evaluation of patients with a diaphyseal clavicle fracture.

Notes:

11:36am–11:42am

Comparison of Skin Surface Pressure Beneath Bias-Cut Stockinette Verses Elastic Bandage Wrapped Splints

Krysten Bell, MD
Sang Le, MD
Hasan Syed, MD
Montri Wongworawat, MD

Introduction: Pressure related complications have been attributed to splinting material. Elastic Ace-type bandages have an intrinsic stretch and recoil that can exert pressure on a swollen limb. Cases of compartment syndrome have been attributed to elastic bandage use, and some surgeons prefer to use bias-cut stockinette, which may lack the compressive properties. In a simulated swelling model, we aimed to compare (1) baseline pressures after dressing application, (2) rates of pressure increase (compliances), and (3) pressures after outer dressing removal.

Methods: After institutional review board approval, sugar-tong splints with an expandable skin surface pressure monitor were placed on a human subject in twenty trials, with elastic bandage and bias-cut stockinette placement randomized. Observers blinded to the purpose of the study placed the outer dressings and the investigators measured pressures at each increment of 5 ml simulated swelling up to 35 ml, recording using an a-line pressure transducer. The bandages were then removed, retaining the splint and cotton padding; pressures were again measured. Linear regression intercepts (extrapolated baseline) and slopes (pressure increase rate) were calculated, and t-statistic was used to compare these parameters. T-test compared post-removal pressures.

Results: Elastic bandages (Ace) produced higher baseline pressures when compared with bias-cut stockinette (11.6±8.0 vs. 5.1±6.6). With each ml of simulated swelling, elastic bandaging had worse compliance (1.3±0.4 vs. 1.2±0.3 mmHg/ml). After cutting off the wrap, both groups' pressures lowered to similar values (elastic: 19.3±2.4 vs. bias: 19.3±2.0 mmHg).

Discussion and Conclusion: Bias-cut stockinette dressing exerts less pressure, is more compliant, and can accommodate swelling better than elastic bandages. We recommend its use over Ace-bandages to reduce the risk of pressure-related complications when this is a concern.

Notes:

11:42am–1148am

MRI Evaluation of the Knee with Non-Ferromagnetic External Fixators: Cadaveric Knee Model

Andrew Yang, BS
Peter Elsissy, MD
Ingrid Kjillen, MD
Joe Unis, MD
Alexander Chien, MD
Serkan Inceoglu, PhD
Wayne K. Cheng, MD

Introduction: The recent advent of MRI safe external fixation devices has made the use of MRI possible in patients who have been treated with external fixation. Although there have been multiple studies determining the safety of MRI scans with ex-fix devices, there are no studies determining the artifact effect of these devices on MRI scans. The purpose of our study is to evaluate the effect of two popular brands of MRI safe external fixators on diagnostic capacity of a knee MRI. We hypothesize that 1) MRI images would have higher noise due to the presence of an external fixator and 2) Images of high diagnostic capacity will be obtainable in the presence of each ex-fix spanning the knee.

Methods: Using seven cadaveric knees, a case-control study was performed to analyze MRI images performed in the presence each external fixator. Scans performed with no ex-fix present served as controls. Signal-to-noise ratios (SNR) were measured at five anatomical structures and compared as a quantitative measure of image quality. Each scan was also graded according to a five-point scale by three blinded musculoskeletal radiologists.

Results: A reduction in signal to noise ratio was identified between Brand 1 and control groups at the patellar tendon, medial meniscus and PCL. Qualitative scoring by three expert radiologists showed no difference in image quality between the Brand 1, Brand 2, and control images.

Discussion and Conclusion: Although the presence of external fixation devices does increase the noise artifact in MRI scans, patients treated with these external fixators can undergo MRI of local structures with high likelihood of obtaining diagnostic quality images.

Notes:

11:48am–11:54am

The Prevalence of Sacro-Iliac Joint Degeneration in Asymptomatic Adults: A Review of 500 CT Scans

Jonathan-James T. Eno, MD
Christopher R. Boone, MD
Michael J. Bellino, MD
Julius A. Bishop, MD

Introduction: Many physicians implicate degenerative changes in the sacro-iliac (SI) joint as a potential cause of low back pain. However, the age-related prevalence of SI joint degeneration in asymptomatic individuals has not been clearly established.

Methods: Pelvic computed tomography (CT) scans of 373 consecutive skeletally mature patients obtained for reasons other than back pain were reviewed for evidence of SI joint degeneration. Patients with a history of back pain, hip or spine surgery, trauma, metastatic cancer or rheumatologic disease were excluded. SI joint degeneration was graded as type 0 if no degenerative changes were present, type 1 in the presence of minimal degenerative changes, type 2 in the setting of significant degenerative changes without ankylosis, and type 3 in the setting of ankylosis.

Results: The overall prevalence of degenerative changes in at least one SI joint was 35% and the prevalence of significant degeneration (type 2 or 3) in at least one SI joint was 30%. The prevalence increased with each decade of life with 16% of patients in the second decade of life and 90% in the 8th decade of life being affected. Significant degenerative changes were not observed in any patients younger than 25 but were present in 43% of patients in the 8th decade of life.

Discussion and Conclusion: Degenerative changes of the SI joints are prevalent in an asymptomatic patient population and appear to be an expected part of human aging. Given the high prevalence of pain free SI joint degeneration, surgeons must be cautious in attributing low back pain to SI joint degeneration seen on CT scan. Diagnostic tests to distinguish SI joint pain from other sources of back pain merit additional research

Notes:

11:54am–12:00pm

Bilateral Sacral Fractures Are Highly Associated with Lumbopelvic Instability

Tiffany N. Castillo, MD
Ian Corcoran-Schwartz, MD
Julius A. Bishop, MD

Introduction: Sacral fractures with associated lumbopelvic instability can be associated with significant instability and neurologic injury not seen in other sacral fracture patterns. Although the diagnosis can be missed on plain radiographs as well as cross-sectional imaging, the presence of bilateral sacral fractures seen on axial CT or MRI is thought to be highly suggestive. The purpose of this study was to quantify the incidence of lumbopelvic instability in the setting of bilateral sacral fracture.

Methods: A retrospective analysis of all sacral fractures treated at a level-I trauma center over a 13-year period was undertaken. Fractures evaluated with CT and MRI imaging were included. When bilateral fractures were identified, sagittal reconstructions were scrutinized of a transverse fracture line, which was used to define lumbopelvic instability. Incidence of lumbopelvic instability was defined and fractures were classified using the Roy-Camille system.

Results: Imaging of 300 sacral fractures treated at our institution since 2000 were reviewed to characterize the fracture patterns and incidence of lumbopelvic instability. 27 (9%) of these were bilateral and 21 had sufficient sagittal reconstructions to evaluate for lumbopelvic instability. Of these 21 bilateral sacral fractures, 21 (100%) had a transverse component indicating some degree of lumbopelvic instability. 16 (76%) were Roy-Camille Type 1, 3 (14%) were Type 2, and 2 (10%) were Type 3**.**

Discussion and Conclusion: Bilateral sacral fractures seen on axial CT scan are frequently associated with some degree of lumbopelvic instability and should alert the treating physician to closely scrutinize the sagittal reconstructions. Early diagnosis and appropriate treatment of lumbopelvic instability are critical in limiting morbidity.

Notes:

12:00pm–12:06pm

Are the Fractures We Treat Becoming More Complex? Trends in Orthopaedic Fracture and Injury Severity, a Level-I Trauma Center Experience

Timothy Alton, MD
Neil S. Tarabadkar, MD
Sean Nork, MD
Lisa A. Taitsman, MD
Conor Kleweno, MD

Purpose (Hypothesis): To define the trends in fracture complexity and overall injury severity of orthopaedic trauma patients at a tertiary Level-I trauma center. We hypothesize that patients presenting to this center in the late 2000's will be more severely injured and have increasingly complex fractures compared to a cohort of patients in the 1990's as determined by the Injury Severity Score (ISS) and the AO/OTA fracture classification.

Methods: Retrospective review of a prospectively collected trauma database to determine the ISS and AO/OTA classification of the most common fractures at this institution from 1995-1999 and from 2008-2012. Inclusion criteria include lower extremity fractures of the femur and tibia (AO/OTA 31-33 and 41-43 A-C) within the years of interest. Exclusion criteria are age <18 years, pathologic fracture, and insufficient medical record to determine ISS or AO/OTA classification.

Results: The total number of fractures increased from 4869 to 5902 between the two cohorts. There was an increase in the percentage of lower extremity periarticular fractures (20.7% to 23.4%), an increase in the percentage of pelvic and acetabular fractures (32.7% to 39.9%), and a decrease in the percentage of lower extremity extra-articular fractures (46.6% to 36.7%). The overall complexity of fractures based on the AO/OTA classification significantly increased between the two time periods (A-type fractures compared to B- and C-types, i.e. extra versus intra-articular). Specifically, the ratio of intra-articular tibial pilon fractures relative to extra-articular tibial fractures increased from 0.29 to 0.60. The ratio of intra-articular tibial plateau fractures relative to extra-articular tibial fractures increased from 0.49 to 0.81. Thus, for each extra-articular tibia fracture, there were 0.79 intra-articular tibial fractures in the earlier cohort compared to 1.4 intra-articular tibia fractures in the later cohort. The ratio of intra-articular distal femur fractures to femoral shaft fractures remained unchanged (0.26 to 0.22,). However, the proportion of femoral shaft fractures decreased from 17.1% to 13.2% of the total fractures, and extra-articular tibia fractures decreased from 19.4% to 13.9%. Acetabular and unstable pelvis fractures significantly increased from 26.9% to 34.4% of the total fractures. The average ISS from 2008-2012 increased compared to 1995-1999 (ISS = 19.2 versus 15.1), being significantly greater for each 10-point stratification of the ISS data (Pearson chi square).

Conclusion: Healthcare economics continue to change in the US, with provider and hospital reimbursements shifting towards being based on patient outcomes with potential penalties for complications and readmissions. In this evolving reimbursement environment, accurate determination of case mix index and patient risk stratification based on anticipated outcomes is increasingly important. These data demonstrate that the complexity of certain lower extremity fractures and the severity of injury of patients treated at this referral institution are high and continue to increase. In the setting of increasing injury severity, we observed proportionally fewer diaphyseal fractures and increased periarticular, acetabular, and unstable pelvic fractures. This information should be considered as new reimbursement algorithms are developed.

Notes:

12:06pm–12:12pm

Does Pelvic Embolization Increase Infection Rates in Patients Who Undergo Open Treatment of Acetabular Fractures

Reza Firoozabadi, MD, MA
Milton Little, MD
Mathew Kogut, MD
Timothy Alton, MD
John Scolaro, MD

Introduction: The effects of pelvic vessel angiography and embolization have been studied by numerous authors in the setting of isolated pelvic ring injuries. However pelvic embolization effects on patients who have undergone open reduc-

tion internal fixation of acetabular fractures has only been reported by one group. Our hypothesis based on our clinical experience was that pelvic embolizaton does not significantly increase infection rates in patients who undergo surgery.

Methods: Retrospective review of prospectively gathered data at a regional Level I trauma center to identify patients who underwent ORIF of acetabular fractures and pelvic angiography from 2005 through 2012. Patients that underwent angiography and embolization were compared to patients who underwent angiography with no embolization. Primary outcome measure was superficial and deep tissue infection rates. Results: Seventy-four total patients were identified. Thirty patients were excluded; 18 for no follow-up past the three month visit, six for death within the acute hospital stay, and six for angiography on contralateral limb from acetabular fracture.

Results: in 44 total patients in final analysis; 26 patients who underwent embolization and 18 patients who underwent angiography with no embolization. Embolization details; 12/26 patients had selective embolization, 19/26 were treated with gelfoam, 2/24 with coils, and 5/24 with coils and gelfoam. 2/26 (8%) patients developed infection in embolization group, one deep and one superficial. 4/18 (22%) patients developed infections in nonembolization group, all deep infections.

Discussion and Conclusions: The 4% deep infection rate in the embolization group is dramatically different than the reported 58% rate found. This study does not support the notion that embolization leads to significantly higher rates of deep infections. This could potentially be attributed to selective embolization and use of gelfoam instead of coiling.

Notes:

Friday, August 1, 2014

Concurrent Session 10 — Upper Extremity 1

Moderator: Basil Besh, MD

11:30am–11:36am

Coracoclavicular Ligament Reconstruction Without Hardware, Drills, or Bone Tunnels: A Novel All-Arthroscopic Technique

William Workman, MD
Leah Drever, MD

Introduction: Traditional surgical options for Grade III AC joint dislocations require a patient to agree to a sizable incision, or the chance of hardware and/ or osseous failure. In an effort to eliminate these issues from the preoperative consent discussion, we sought a method to avoid large incisions, hardware, and the chance of fracture. We developed a minimally invasive arthroscopic technique using an all suture repair for acute cases or suture plus allograft for chronic cases.

Methods: A retrospective case review was carried out on the first 12 patients who had this procedure. 12 patients (11 male and 1 female) with an average age of 39.1 (17-56) were identified with a Grade III (one Grade IV) AC joint separation and elected to proceed with an arthroscopic coracoclavicular ligament reconstruction at an average of 7.5 (.3-56.6) months from the date of injury. The procedure is performed arthroscopically through three incisions of five millimeters in length. Debridement of the subacromial and subcoracoid space is carried out to expose the coracoid and clavicle. For acute cases, #5 suture is passed beneath and around the coracoid under arthroscopic visualization using standard surgical instruments. The suture is then passed over and around the clavicle and tied with a secure arthroscopic sliding knot while the AC joint is held in reduction. For chronic cases, a posterior tibial tendon allograft is prepared on the back table with a running locking suture and then passed in the same fashion as the #5 suture. Before the graft is secured, a limb of the graft is passed around the newly looped graft and then secured with an arthroscopic knot. The patients have been followed for an average of 34.3 (1-68) months postoperatively. Outcomes were assessed with both the UCLA Shoulder Score and the Constant Shoulder Score.

Results: 10 of 12 patients have been reached for follow up. Of the 10 patients reached, all were scored with both the UCLA and Constant Shoulder Score exams. For the UCLA Score, the group scored an average of 27.6 (11-30). A grade of >22 is considered excellent. For the Constant Score, the group averaged 9.1 (0-66). A grade of <11 is considered excellent. Subjectively, there were few complaints. Only one patient complained that one of his incisions was unsightly. One patient was unsatisfied with physical therapy and one patient has some difficulty sleeping on the operative side. One patient is only one month out from surgery and has much less desirable outcome scores likely due to the short follow up. No patient complained of recurrence of deformity.

Conclusion: This novel technique for coracoclavicular ligament reconstruction has proven safe and effective in this small group of patients. The outcome scores as a group are excellent and there have been no complications related to failure of fixation, bone fracture, or recurrence of deformity. These encouraging early results will allow the senior author to continue to employ this technique and report back with intermediate term results at the appropriate interval.

Notes:

11:36am–11:42am

The Incidence of Propionibacterium Acnes in Shoulder Arthroscopy

Wesley Nottage, MD
*Michael J. Chuang, MD
Jason Jancosko, DO
Vivian Mendoza, MD

Introduction: Propionibacterium Acnes (P. Acnes) is a gram-positive bacillus implicated as a causative pathogen in infections and noted to be a common cause of indolent infection in shoulder arthroplasty and open surgery. Current literature does not describe the incidence of P. Acnes colonization or inoculation after arthroscopic shoulder surgery.

Methods: We prospectively collected data on all shoulder arthroscopy patients who agreed to participate in the IRB approved study. All patients received routine antibiotic prophylaxis of cephalexin, 1 gram intravenously within one hour of the start of the procedure. Penicillin sensitive individuals received either vancomycin 1 gram intravenously, or erythromycin 500 milligrams intravenously one hour prior to the skin incision. Initial cultures were obtained prior to the skin preparation by swabbing the skin at three proposed portal sites: standard posterior, anterior superior, and anterolateral subacromial. The skin preparation utilized chlorhexidine solution 4% w/v scrub for 5 minutes, followed by a 2% chlorhexidine gluconate (CHG) and 70% isopropyl alcohol paint to the entire exposed shoulder. Standard shoulder drapes were utilized, leaving the shoulder exposed from the mid-clavicular line to the elbow. After completion of the arthroscopic procedure, a second culture was obtained under direct arthroscopic vision down a cannula at the surgical site. All cultures were plated for 21 days using brucella medium, and reported at 7, 14 and 21 days. P. acnes positive cultures were identified as anaerobic, Gram positive rods, white to cream colored colonies, with a confirmatory indole and catalase test. Any other organisms were not reported. The final cultures from the portal site skin (superficial) preoperatively were compared those from the surgical site at the conclusion of the procedure (deep). We then recorded the clinical incidence of deep colonization in these patients at 14 days and 21days. The patients were clinically evaluated at 10 days and 30 days post-operatively, and then monthly for six months. Data concerning age, sex, diagnosis, and procedure was recorded to correlate with the incidence of P. Acnes colonization.

Results: The initial 33 patients demonstrated a 69.7% P. Acnes superficial colonization rate. We identified a deep culture positive inoculation rate of 15.2% (5 cases). 100% of the positive deep cultures had also a positive P. Acnes skin colonization. Clinical follow-up demonstrated no signs of deep infection in this deep culture group, who followed the expected post-operative course. None of the deep culture positive patients were treated with antibiotics. No correlation could be made concerning the diagnosis, procedure, age or sex with the occurrence of deep P. Acnes colonization.

Discussion and Conclusion: P. Acnes colonization can lead to deep infection in the setting of open shoulder surgery. It is debated if it is introduced at the time of open surgery, or pre-dated the procedure. We have shown that in shoulder arthroscopy, despite standard pre-operative skin care and standard prophylactic antibiotics, deep tissue inoculation with P. Acnes is common, but does not manifest itself as a clinical post-operative infection. The high correlation of colonization to inoculation brings up the question whether

initial skin prep with benzoyl peroxide could alter these inoculation rates.

Notes:

11:42am–11:48am

Effect of Ulnar Variance on Distal Radius Bone Density and Failure Load

Danielle Casagrande, MD
Randal P. Morris, BS
Nikoletta Carayannopoulos, DO
William L. Buford Jr., PhD

Introduction: Factors besides systemic osteoporosis likely affect bone mineral density at the distal radius. Ulnar variance (UV) significantly affects load distribution through the distal radius. The radius can bear up to 94% of the load in an ulnar-negative wrist or as little as 58% in an ulnar-positive wrist. In accordance with Wolff's law, we hypothesized that UV is inversely related to both bone density and the sustained load to failure at the distal radius.

Methods: Twelve matched-pair embalmed cadaver forearms were used. Posteroanterior radiographs were taken of the forearms in neutral rotation and UV was measured for each wrist by the method of perpendiculars. CT scans of the wrist were obtained and a previously defined, typical fracture region within the distal radius was isolated to measure cortical, trabecular, and combined bone density in Hounsfield units. The radii were excised, cleaned of soft tissue, then individually potted and mounted in a Materials Testing System machine. The radii were axially loaded against an impression mold of the articular surface at a rate of 1 mm/s until fracture. Linear regression analysis was used to determine correlations between UV, bone density, and failure load.

Results: UV inversely correlated with cortical bone density within the typical fracture region of the distal radius (R2 = 0.56). Cortical bone density positively correlated with load to failure of the distal radius (R2 = 0.58). In a unique finding, UV inversely correlated with load to failure at the distal radius, within the typical fracture region (R2 = 0.56).

Discussion and Conclusion: Future research may confirm positive UV as a risk factor for sustaining distal radius fractures. Clinicians may then focus on creating exercises to strengthen the wrist in individuals at risk and evaluate whether the exercises can reduce the risk for future fractures and functional decline.

Notes:

11:48am–11:54am

Isolated Metacarpal Shaft Fractures in an Active Duty Population

Emily Morgan, MD
MAJ Nicholas Noce, MD

Introduction: Isolated metacarpal shaft fractures are common injuries treated by orthopaedic surgeons, however the treatment and known outcomes of these injuries are based predominantly on anecdotal evidence. We hypothesized that the majority of isolated diaphyseal metacarpal fractures in active duty soldiers would be amenable to nonoperative treatment and do not typically result in functional limitations in this high demand population.

Methods: A retrospective review was performed of the electronic medical record regarding the treatment of active duty soldiers at our institution who sustained isolated metacarpal shaft fractures. Radiographs were reviewed to confirm the diagnosis, anatomic location, and fracture pattern of the injury. Patients were excluded if their injury was sustained in combat, if the injury was involved in polytrauma, or if the fractures were open. Records were reviewed to identify the treatments utilized as well as the duration of temporary and permanent duty limitations determined by the treating physician.

Results: 45 active duty soldiers were identified who sustained isolated metacarpal shaft fractures and were treated at our institution over a 30 month period. The fifth metacarpal was most commonly involved, representing 60% of the fractures. The most common fracture pattern was transverse, representing 35.6% of the fractures. Only 2 patients required operative treatment for inability to maintain reduction of their fracture, namely >4 mm of shortening and/or 100% translation at the fracture site. The average duration of a temporary work restriction was 40 days. Only one patient required a permanent profile for functional limitation following his injury, this patient had undergone operative treatment**.**

Discussion and Conclusion: Isolated metacarpal shaft fractures can typically be treated with non-operative treatment regardless of which metacarpal is involved and the fracture pattern involved. Metacarpal fractures are typically not associated with functional limitations in high demand patients such as active duty soldiers.

Notes:

11:54am–12:00pm

Medicare Insurance Prolongs Hospital Stay Following Total Shoulder Arthroplasty in Patients Discharged to Skilled Nursing Facility

Mark E. Mildren, MD
Krysten Bell, MD
Wesley P. Phipatanakul, MD
Montri Wongworawat, MD
Torrey Parrey, BS

Introduction: Elective total shoulder arthroplasty in the elderly is a successful procedure. Centers for Medicare and Medicaid Services (CMS) currently require a three night minimum hospitalization prior to placement in a skilled nursing facility (SNF). Our study goals were to compare (1) average length of stay (2) proportions of prolonged stay (3) readmission rates at 30 and 90 days between Medicare and non-Medicare patients discharged to SNF.

Methods: We reviewed a retrospective cohort of patients 65 years of age or older having undergone elective primary total shoulder arthroplasty by a single surgeon that were discharged to SNF (n=35). Medicare versus non-Medicare patients were assessed for length of post-operative stay, relative risk of prolonged stay and readmission rates. Determination of equivalency of the two cohorts was based on patient age, sex, American Society of Anesthesiologists classification (ASA) and body mass index (BMI), all of which were similar.

Results: In patients discharged to SNF following total shoulder arthroplasty, Medicare insurance was associated with significantly longer post-operative hospitalization days vs non-Medicare insurance (3.09 ± 0.43 vs 1.93 ± 0.28). Of note, 95% of Medicare patients and 0% non-Medicare patients were medically cleared for discharge prior to actual discharge to SNF. Having Medicare puts the patient at significant relative risk (95% CI: 2.17 to infinity) of prolonged hospitalization. Readmission rates at 30 and 90 days showed no difference between cohorts.

Discussion and Conclusion: In patients being discharged to SNF, patients with Medicare had disproportionately longer hospitalizations compared to patients without Medicare insurance. Requiring a prolonged inpatient stay following total shoulder arthroplasty to fulfill insurance requirements may lead to increased health care cost and place patients at additional risk of nosocomial morbidity.

Notes:

12:00pm–12:06pm

Preoperative Costs Associated with Evaluation and Therapy Prior to Shoulder Arthroplasty

Adam Z. Khan, BS
Gabriel A. Arom, BS
Michael G. Yeranosian, MD
Jeremiah R. Cohen, BS
Jeffrey C. Wang, MD
David R. McAllister, MD
Frank A. Petrigliano, MD

Introduction: While the cost-effectiveness of shoulder arthroplasty has been previously described, no prior study has estimated the cost of preoperative diagnostic and therapeutic interventions in patients undergoing shoulder replacement. Yet, these costs have important implications in the context of efficient health care delivery.

Methods: A database of insurance records of orthopaedic patients was used to identify all individuals undergoing shoulder arthroplasty between 2004 and 2009. Reimbursement codes for the 90-day period prior to surgery were sorted into the following categories: diagnostic imaging studies, outpatient physician visits, laboratory and other preoperative studies, physical therapy, injections, and miscellaneous. Charges associated with each procedure, the frequency of each procedure, and the percentage of patients undergoing each procedure were recorded.

Results: A total of 3,643 patients underwent shoulder arthroplasty during the study period: 1,557 (43%) hemiarthroplasty and 2,086 (57%) total shoulder arthroplasty. In the hemiarthroplasty group, total expenditures during the 90-day preoperative period were $1,810,682, or $1,163 per patient; patients undergoing total shoulder arthroplasty represented a total preoperative cost of $2,279,541, or $1,092 per patient. The largest preoperative cost for both hemiarthroplasty and total shoulder arthroplasty was diagnostic imaging, totaling $1,954,236 (48%) followed by outpatient visits totaling $1,090,987 (27%), labs and preoperative studies $436,633 (11%), physical therapy $256,033 (6%), injections $216,532 (5%), and miscellaneous $135,802 (3%).

Discussion and Conclusion: Preoperative evaluation costs prior to shoulder arthroplasty are significant; the majority of which result from diagnostic imaging. Appropriate utilization of preoperative diagnostic and therapeutic modalities may aid clinicians in reducing these expenditures.

Notes:

2014 Scientific Program Abstracts — Saturday

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

Saturday, August 2, 2014

General Session 12 — WOA/OREF Young Investigator Awards

Moderator: Melvyn A. Harrington Jr., MD

8:25am–8:33am

Conventional Versus Virtual Radiographs of the Injured Pelvis and Acetabulum

Julius A. Bishop, MD
Allison J. Rao, BA
Michael A. Pouliot, MD
Christopher F. Beaulieu, MD, PhD
Michael J. Bellino, MD

Introduction: Evaluation of the fractured pelvis or acetabulum require both standard radiographic evaluation as well as computed tomography (CT) imaging. The standard anterior-posterior (AP), Judet, and inlet and outlet views can now be simulated using data acquired during CT, decreasing patient discomfort, radiation exposure, and cost to the healthcare system. The purpose of this study is to compare the image quality of conventional radiographic views of the traumatized pelvis to virtual radiographs created from pelvic CT scans.

Methods: Five patients with acetabular fractures and 10 patients with pelvic fractures were identified using the orthopaedic trauma database at our institution. These fractures were evaluated with both conventional radiographs as well as virtual radiographs generated from a CT scan. A web-based survey was created to query overall image quality and visibility of relevant anatomic structures. This survey was then administered to members of the Orthopaedic Trauma Association (OTA).

Results: 97 surgeons completed the acetabular fracture survey and 87 completed the pelvic fracture survey. Overall image quality was judged to be statistically superior for the virtual as compared to virtual images for acetabular injuries (3.15 vs 2.98, p=0.02), as well as pelvic ring injuries (2.21 vs. 1.45, p=0.0001). Visibility ratings for each anatomic landmark were statistically superior with virtual images as well.

Discussion: Virtual radiographs of pelvic and acetabular fractures offer superior image quality, improved comfort, decreased radiation exposure and a more cost-effective alternative to conventional radiographs.

Notes:

8:33am–8:41am

Risk of Spermatic Cord Injury During Anterior Pelvic Ring and Acetabular Surgery: An Anatomical Study

Reza Firoozabadi, MD, MA
Paul Stafford
Milton "Chip" Routt Jr., MD

Introduction: Anterior pelvic ring surgery includes a variety of plating techniques and insertion of retrograde superior pubic ramus screws. Anterior acetabular surgery also includes fixation through an ilioinguinal or Stoppa approach. These exposures risk injury to the spermatic cord and accompanying genital branch of the genitofemoral nerve. The primary aim of this study was to identify the distance between the midline and the spermatic cords in adult male cadaveric specimens. The secondary aim was to determine spermatic cord diameters and measure the distance between the spermatic cord and implant during instrumentation of a retrograde superior pubic ramus medullary screw.

Methods: Extended Pfannenstiel and Stoppa approaches were performed on 18 embalmed male cadavers bilaterally.

Spermatic cord characteristics were recorded and a number of measurements were performed to determine the distance of implants and the midline from the spermatic cord.

Results: The average distance between the midline and spermatic cords was 34.2 mm. The average distance between the spermatic cord and implant was 18.2 mm. Eleven of the thirty-six dissections had abnormalities including cord lipomas and inguinal hernias. The average cord diameter was 18.6 mm. The average cord diameter in those with abnormalities was 24.9 mm and 16 mm in those without abnormalities, this difference was statistically significant.

Discussion and Conclusions: Due to the proximity of the spermatic cord, the surgeon should either formally expose the cord or limit lateral dissection from the midline during Pfannenstiel and Stoppa exposures. Similarly, the surgeon should use soft-tissue sleeves and oscillating drills to avoid injury to the contralateral spermatic cord during the insertion of retrograde superior pubic ramus medullary screws.

Notes:

8:41am–8:49am

Patients' Willingness to Contribute to Cost of Novel Implants in Total Joint Arthroplasty

Ran Schwarzkopf, MD, MSc
Jeffrey N. Katz, MD, MSc
Stephanie Chen, BA
Yan Dong, PhD
Laurel Donnell-Fink, MPH
Elena Losina, PhD

Background: As health care organizations prepare to adapt more accountable financial models of care, it is increasingly important to assess how patients value new technologies, as reflected in willingness to contribute to the cost of using newer implants. This study assess whether patients' willingness to contribute to the cost of joint arthroplasty implants is associated with reported implant performance and with patient sociodemographic characteristics.

Methods: A questionnaire was administered to patients at a rheumatology practice. It captured demographics, educational level, and health insurance. We described features of a 'standard' implant including longevity of 15-years and risk of complications at 3%. We elicited whether participants would be willing to contribute to the cost of three 'novel implants: 1) longevity of 25-years with 3% risk of complications; 2) longevity of 25-years with 5% risk of complications; 3) standard longevity (15-years) with a lower 1% risk.

Results: Study included 195-patients, average age 56.3years. 45% of subjects were willing to pay added co-pay to increase longevity of an implant to 25-years with no change in complications. Willingness to pay for increased longevity decreased to 26% if longevity was accompanied by increased (5%) risk. 29% were willing to pay for an implant with standard (15-year) longevity and a decreased (1%) risk. Men were more willing to pay for novel implants, and older patients were less willing, especially for added longevity. Patients with higher education were willing to add co-pay for increased longevity and for decreased risk. Patients with private insurance compared to Medicare and Medicaid were willing to add co-pay for increased longevity.

Conclusion: This study demonstrated that 26%-45% of patients are willing to share costs of a novel prosthesis. Willingness to pay was associated with the proposed implant benefits (increased longevity, decreased complications) and with patient characteristics. These findings help clarify the extent that patients are willing to bridge gaps between the cost of novel implants and the reimbursement offered by payers.

Notes:

Saturday, August 2, 2014

General Session 13 — WOA Resident Awards

Moderator: Bryan S. Moon, MD

9:20am–9:28am

Immediate Weight Bearing as Tolerated After Locked Plating of Fragility Fractures of the Femur

Seth H. Criner, DO
Jacqueline Krumrey, MD

Introduction: Our goal was to determine if a particular brand of locked periarticular femoral plates can withstand immediate weight bearing as tolerated following open reduction internal fixation. We believed this would allow for increased mobilization and therefore potentially better outcomes in the early postoperative period.

Methods: A total of 31 patients underwent locked femoral plating between 2007 and 2011. All surgery was performed by a single surgeon. Patients included were those who were physiologically aged and sustained a ground level fall resulting in a femur fracture. Patients were either kept non-weight bearing (NWB) for a minimum of 6 weeks or allowed immediate weight bearing as tolerated (WBAT). Charts and x-rays were retrospectively reviewed. Two patients were lost to follow up in the NWB and two patients were lost to follow up in the WBAT group, leaving a total of 27 patients for review. Mortality rate was reviewed at 6, 12, and 13 months. X-rays were reviewed for fracture healing and hardware failure.

Results: We had 13 patients in the NWB group and 14 patients in the WBAT group. There was no statistical difference between the two groups for age, smoking, diabetes, or use of bisphosphonates. Two screws broke in one NWB patient at 9 months, and one screw broke in one WBAT patient at 10 months. This was not statistically significant. No patients had failure of fixation requiring re-operation. At 6 months, the mortality rate in the NWB group was 23% versus 0% in the WBAT group (p=0.06, RR=7.35 (95% CI 0.45-207.9)). At 13 months, the mortality rate in the NWB group was 39% versus 7% in the WBAT group (p=.05, RR=5.39 (95% CI 0.72-40.20)).

Conclusions: Our results suggest that patients with low energy femur fractures may safely weight bear as tolerated following fixation with locked periarticular femoral plates. There is a trend toward decreased mortality at 6 months following fracture fixation for patients allowed immediate weight bearing as tolerated, and a statistically significant difference in mortality at 13 months following fracture fixation for patients allowed immediate weight bearing as tolerated. Weaknesses of our study include retrospective design and small numbers. We cannot extrapolate our hardware failure data to other brands of locked plating systems. Because early mobilization appears to decrease the mortality rate in this elderly population, our study warrants further investigation into immediate weight bearing as tolerated following locked fixation of femur fractures.

Notes:

9:28am–9:36am

Infection Rate of Intramedullary Nailing Following Temporizing External Fixation in Closed Fractures of the Femoral Diaphysis

Joseph W. Galvin, DO
Joseph H. Dannenbaum IV, MD
Creighton C. Tubb, MD
Thomas P. Poepping, MD
Jason A. Grassbaugh, MD
Edward D. Arrington, MD

Introduction: The injuries sustained by military personnel in the Global War on Terror present a large subset of closed diaphyseal femur fractures which were treated with initial external fixation and later conversion to an intramedullary nail. The objective of this study is to determine the infection rate of intramedullary nailing following temporary stabilization with external fixation in closed fractures of the femoral diaphysis treated initially in an austere environment.

Methods: Military personnel who underwent temporizing external fixation of a closed femoral diaphyseal fracture with later conversion to an intramedullary nail between 2003 and 2012 were identified from the Joint Theater Trauma Registry and Department of Defense electronic medical record.

Results: 124 patients, mean age 25 (18-43) years, sustained 127 closed femoral diaphyseal fractures from May 2003 to July 2012. External fixation was performed at a mean of 0.2 (0-3) days post-injury. Mean time to intramedullary nail conversion procedure was 6.9 (1-20) days. All conversion procedures were performed at less than 21 days. Infection rate was 2.4%. Average follow up was 41.4 (2-119) months.

Discussion and Conclusion: Infection rate following conversion of external fixation to intramedullary nailing in closed femoral diaphyseal fractures is low. Our results indicate that external fixation can be safely converted to a definitive intramedullary device within 21 days. Our study found an infection rate that is similar to those values previously reported in the literature for early definitive management of femoral diaphyseal fractures without external fixation.

Notes:

9:36am–9:44am

Local Versus Distal Transplantation of Human Neural Stem Cells Following Chronic Spinal Cord Injury

Michael Githens, MD
Robert L. Smith, PhD
Allison J. Rao, BA
Tyler Johnston, MC
Michael P. Stauff, MC
Ivan Cheng, MC

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

Methods: 4 groups of Long-Evans hooded rats were identified: 2 experimental and 2 control. All subjects underwent a laminectomy at the T10 level. A moderate spinal cord contusion at the T10 level was incurred by use of the Multicenter Animal Spinal Cord Injury Study Impactor. Experimental subjects received a subdural injection of hNSCs adjacent to the site of injury or an intrathecal injection of hNSCs through a separate laminotomy made in the mid-lumbar spine distal to the site of injury 4 weeks after injury. Control subjects received an injection of control media alone. Subjects were assessed following injury and then weekly for 10 weeks using the BBB Locomotor Rating Score.

Results: 24 subjects underwent spinal cord injury and injection, 6 in each group (local cells, local media, distal cells, distal media). A statistically significant functional improvement in subjects that received hNSCs injected distally to the site of injury was observed when compared to control. There was no significant difference between subjects that received hNSCs locally compared to control.

Discussion and Conclusion: The transplantation of hNSCs into the contused spinal cord of a rat led to significant functional recovery of the spinal cord when injected distally but not locally to the site of chronic spinal cord injury. Patients may be able to receive a potentially therapeutic injection of hNSCs through a traditional lumbar puncture in the chronic phase after their injury.

Notes:

9:44am–9:52am

One Brace, One Visit: Treatment of Distal Radius Buckle Fractures in Children with a Removable Wrist Brace and No Follow-Up Visit

Megan Kuba, MD
Byron H. Izuka, MD
Krister P. Freese, MD

Introduction: Previous studies have shown: (1) the efficacy of brace treatment for distal radius buckle fractures and (2) that these inherently stable injuries do not require additional radiographic imaging. However, no study has looked at a

treatment protocol combining both of these aspects. We sought to determine if the treatment of pediatric distal radius buckle fractures with a removable brace and no physician follow-up or imaging after the initial visit is a safe and satisfactory approach.

Methods: 42 consecutive patients with a diagnosis of distal forearm buckle fracture seen by a single (fellowship trained) pediatric orthopaedic surgeon were recruited to participate in this IRB approved study. 2 patients refused participation, leaving 40 patients treated by immobilization with a removable wrist brace for a prescribed time period with no clinical or imaging follow-up. Two telephone surveys were then conducted: the first within 1 week of the designated brace-removal date to determine treatment compliance and the second 5-10 months post-injury to determine patient outcomes and parent satisfaction.

Results: 100% of patients were reached for the initial phone survey. 36/40 patients (90%) were available for the second survey. There were no complications, including re-fracture or residual pain, following the treatment. Only 4/36 (11%) required pain medication, all of whom took only either over-the-counter ibuprofen or acetaminophen. 100% of parents said they would choose to have the same treatment again, as 68% of parents would have had to miss work and 78% of patients would have had to miss school to attend a follow-up appointment.

Discussion and Conclusion: Treatment of distal forearm buckle fractures with a removable brace and no follow-up visit results in both good patient outcomes and parental satisfaction. This treatment method is cost-effective, prevents additional radiation exposure, and increases access to care in the busy pediatric orthopaedic practice.

Notes:

9:52am–10:00am

In Vivo Evaluation of Electrospun Polymer Grafts for ACL Tissue Engineering

Natalie L. Leong, MD
Nima Kabir, MD
Armin Arshi, BS
Azadeh Nazemi
Benjamin M. Wu, DDS, PhD
David R. McAllister, MD
Frank A. Petrigliano, MD

Introduction: The ACL is critical for the structural stability of the knee and its injury often requires surgery. Because current reconstruction methods using autograft or allograft tissue suffer from donor site morbidity and limited supply, there has been emerging interest in the use of bioengineered materials for ligament reconstruction. Here, we report the use of electrospun polycaprolactone scaffolds in an in vivo model.

Methods: Biodegradable ACL grafts were fabricated from electrospun polycaprolactone and implanted into sixteen 7-9 week old male athymic rats. Employing a medial parapatellar approach, the native ACL was severed and reconstruction was performed with engineered grafts, with and without basic fibroblast growth factor (bFGF). The rats were sacrificed at 16 weeks postoperatively, and biomechanical testing as well as histology/immunohistochemistry were performed on both the reconstructed and contralateral native ACLs.

Results: All rats underwent surgery without any complications. Hematoxylin and eosin staining demonstrated infiltration of the grafts with cells, and immunohistochemical staining for the inflammatory marker CD68 was minimal within the implanted grafts, indicating minimal immune response. Immunohistochemistry for type I collagen demonstrated elaboration of aligned collagen fibers. At 16 weeks postop, mechanical testing of the grafts without growth factor demonstrated a stiffness of 12.4+3.8 N/mm and a peak load of 16.0+3.4 N, as compared to 23.3+8.1 N/mm and 23.1+6.1 N, respectively, in grafts with bFGF.

Discussion and Conclusion: This study employed an acellular electrospun PCL graft to reconstruct the rodent ACL, and demonstrated the elaboration of dense, aligned collagen throughout the graft with mechanical properties approaching that of native ligament, with minimal inflammatory response. Additionally, our data showed bFGF enhanced the mechanical properties of the graft. Thus, future studies of electrospun

PCL for ligament engineering models are warranted. In the future, incorporation of supporting cell types could be used to enhance host integration and graft functioning.

Notes:

10:00am–10:08am

Controlled Release of Vancomycin and Tigecycline from an Orthopaedic Implant Coating Prevents Staphylococcus Aureus Infection in an Open Fracture Animal Model

Jared Niska, MD
S. Suwei Zhu, PhD
Alexandra I. Stavrakis, MD
Amanda H. Loftin, BS
Jonathan H. Shahbazian, BS
Tatiana Segura, PhD
Lloyd S. Miller, MD, PhD
Nicholas M. Bernthal, MD

Introduction: Treatment of open fractures routinely involves multiple surgeries and delayed definitive fracture fixation because of concern for infection. If implants were resistant to infection, a 1-stage procedure with intramedullary nailing would be more feasible, which would reduce morbidity and improve outcomes.

Methods: In this study, a novel open fracture mouse model was developed using Staphylococcus aureus (S. aureus) and single stage intramedullary fixation. The model was used to evaluate whether implants coated with PEG-PPS polymer containing vancomycin or tigecycline would be effective against a fracture infected with S. aureus. Antibiotic release was quantified in vitro, and in vivo bioluminescence, ex vivo CFUs and X-ray images were evaluated over 42 days.

Results: We found a marked therapeutic benefit with the local release of vancomycin and tigecycline from the PEG-PPS polymer compared to polymer alone. Vancomycin was released in a controlled fashion and maintained local drug concentrations about the MIC for S. aureus for greater than 7 days. Bacteria were reduced 139-fold from implants containing vancomycin and eliminated from the bone and soft tissue. Tigecycline coatings led to a 5991-fold reduction in bacteria isolated from bone and soft tissue and 15-fold reduction on the implants compared to polymer alone. Antibiotic coatings also prevented osteomyelitis and implant loosening as observed on X-ray.

Discussion and Conclusion: Vancomycin and tigecycline can be encapsulated in a polymer coating and released over time to maintain therapeutic levels during the peri-operative period. Our results suggest that antibiotic coatings can be used to prevent implant infection and osteomyelitis in the setting of open fracture. This novel open fracture mouse model can be used as a powerful in vivo preclinical tool to evaluate and optimize the treatment of open fractures before further studies in humans.

Notes:

10:08am–10:16am

Do Patients with Income-Based Insurance Have Access to Total Joint Arthroplasty?

Duy Phan, MD
Ran Schwarzkopf, MD, MSc
Melinda Hoang, BA
Steven Ross, MD
Dana Mukamel, PhD

Introduction: Increasing patient access to health care is a prominent policy objective. The Patient Protection and Affordable Care Act (PPACA) is expected to address this through Medicaid expansion. The goal of this study was to examine access to total hip arthroplasty for patients residing in Southern California. Our hypothesis is that patients with income-based insurance have a significantly lower rate of access as determined by insurance acceptance and surgeon availability.

Methods: The offices of 39 orthopaedic surgeons in Southern California were called to schedule a total hip arthroplasty. Insurances used included a Preferred Provider Organization (PPO), Medicare, and three income-based insur-

ances: Medi-Cal, CalOptima, and Medical Services Initiative (MSI). Data obtained included the number of accepting offices, the time to the first available appointment, and the surgeon's fellowship training. Fisher Exact tests and T-tests were used to compare overall insurance acceptance rates, acceptance based on fellowship training, and time until appointment.

Results: When evaluated as a group, there was a significant difference in the rate of acceptance for the five insurances. There was a significant difference in the rate of acceptance when comparing PPO patients and Medicare patients directly with Medi-Cal, CalOptima, and MSI patients. There was no difference in the average time to appointment or in the proportion of patients accepted based on the fellowship training of the surgeon.

Discussion and Conclusion: This study showed that in Southern California, there is a significant difference for the rate of access to total hip arthroplasty. Patients with income-based insurances are very limited in the number of surgeons from whom they can receive care. These findings raise concerns that the PPACA objectives of providing access for the uninsured through Medicaid enrollment will not be achieved. Although the PPACA will increase the number of insured patients, it may not similarly increase access to providers.

Notes:

Saturday, August 2, 2014

Concurrent Session 15 — Total Knee

Moderator: Brian S. Parsley, MD

12:00pm–12:06pm

Intra-Articular Injection of Low Molecular Weight Fraction of 5% Human Serum Albumin is Associated with Sustained Improvements in Moderate-to-Severe Osteoarthritis Knee Pain

Nathan Wei, MD
Kristin M. Salottolo, MPH
Holli Loose, MSc
Matthew J. Phillips, MD
Brian McGrath, MD
Vaughan Clift, MD
David Bar-Or, MD

Introduction: Osteoarthritis (OA) is the most common form of arthritis, affecting at least 27 million people in the United States. This analysis is a 20-week extension of a multicenter, randomized, vehicle-controlled, double-blind study (NCT01839331) that evaluated the efficacy and safety of the low molecular weight fraction of 5% human serum albumin (LMWF-5A) for treatment of inflammation-associated pain in symptomatic OA of the knee (OAK).

Methods: Ninety-seven patients who received a 4-mL intra-articular injection of LMWF-5A or vehicle control were followed for an additional 8 weeks beyond the initial 12-week study endpoint. Efficacy measures included changes from baseline in Western Ontario and McMaster Universities Osteoarthritis (WOMAC) pain and function subscores. Patients were considered "responders" if they achieved ≥40% improvement in WOMAC pain and function. Differences between treatment groups were evaluated by chi-square test or ANCOVA, adjusted for baseline values.

Results: In a subgroup of patients with moderate-to-severe OAK (Kellgren-Lawrence grades 3-4; n=64), there were statistically significant improvements in WOMAC pain (mean change from baseline -0.99 vs -0.65) and function scores (-0.85 vs -0.58) over 20 weeks for patients who received LMWF-5A compared with vehicle control, respectively. Treatment-versus-placebo–associated differences in pain

(-0.95 vs -0.77) and function (-0.79 vs -0.63), respectively, were observed in the per-protocol population. At 20 weeks, the percentage of pain responders in the moderate-to-severe subgroup was significantly higher for patients who received LMWF-5A (50%) relative to those who received vehicle control (25%). Similar rates and severity of adverse events were observed in the LMWF-5A and control groups.

Discussion and Conclusion: A single injection of LMWF-5A was associated with sustained improvements in knee pain and may provide a therapeutic option for patients with moderate-to-severe OAK. Our findings demonstrate significant benefit of LMWF-5A for patients with objective evidence of true OAK and high therapeutic need.

Notes:

12:06pm–12:12pm

Los Angeles County Total Hip and Knee Patients Are More Engaged in Their Health Behavior

Cory Pham, BS
John Andrawis, MD
Gavin Tsuchida, BS
Matthew Satyadi
Daniel Alvarado
Martina Shoukralla

Introduction: Total Hip and Knee arthroplasty procedures are highly effective; however, despite having overall improvements in health related quality-of-life dimensions there are individuals who have complications and poor outcomes. The evidence to date shows the importance of biomedical, behavioral and social factors on recovery after joint replacement surgery, but these factors do not fully account for the variability in outcomes. To analyze patient activation in patients undergoing total hip or knee arthroplasty in a distinct population and investigate whether individuals within this population have lower patient activation.

Methods: In this prospective study, patient activation was assessed preoperatively and correlated with baseline evaluations of demographic information. The PAM is a patient-completed 13-item questionnaire that addresses key psychological factors and personal competencies.

Results: PAM scores did not follow a normal distribution with mean score of 76.4 (SD 20.6). There were no significant differences among quartile groups with respect to sex, age, insurance coverage, and ethnicity. Individuals born in the United States showed predictive PAM compared to individuals born in a foreign country. Employed individuals were significantly likely to have higher physical health scores. PAM scores were correlated with higher mental health scores.

Discussion and Conclusion: Harbor-UCLA Medical Center is a publicly funded medical center that generally provides service for individuals that must demonstrate an income around the Federal Poverty Line. As a result the baseline demographic information provided is significantly different than those patients at other medical centers in terms of employment status and level of education. However, despite their low socio-economic status, individuals at Harbor-UCLA medical center had a higher activation score compared to scores reported in the literature (avg. 55). Higher PAM suggests that this unique patient population constrained by socio-economic limitations were more likely to engage in adaptive health behavior leading to higher patient activation measurement.

Notes:

12:12pm–12:18pm

Perioperative Outcomes of Primary Total Knee Arthroplasty Stratified by Body Mass Index

Jake R. Adams, MD
Matt Dehart, BS
Thomas W. Huff, MD

Introduction: With the growing obesity epidemic, there has been an increased interest in functional outcomes and complication rates in patients with higher body mass index (BMI) in

primary total knee arthroplasty (TKA). Perioperative differences based on a patient's BMI has received little attention. We hypothesize that perioperative outcomes of primary TKA will be similar independent of the patient's BMI.

Methods: A retrospective review of all primary TKAs performed by a single surgeon was examined between July 2008 and April 2013. All patients received cemented, posterior stabilized TKA through a medial parapatellar approach. Patient's BMI was stratified according to the world health organization definition (normal: 18.5-24.9; overweight: 25-29.9; obese class 1: 30-34.9; obese class II: 35-39.9; obese class III: ≥ 40). Perioperative outcomes measured include tourniquet and total surgical time, blood loss, drain output, transfusion requirements, and length of stay.

Results: 339 patients underwent 398 TKAs during the study period (normal: 47 cases; overweight: 117 cases; obese class I: 110 cases; obese class II: 76 cases; obese class III: 48 cases). The mean BMI was 32 kg/m2, age was 63 years, with 66 percent of cases performed in females. Between the five groups, there were no differences in tourniquet time (p=0.578), total surgical time (p=0.384), estimated blood loss (p=0.537), drain output (p=0.393), transfusion requirements (p=0.594), or length of stay (p=0.260). Obese classes I-III had a lower post-operative hematocrit change than those in the normal BMI group (p=0.001). No intra-operative complications occurred.

Discussion: Primary TKA can be safely performed with similar perioperative outcomes independent of the patient's BMI. This adds to the growing body of evidence that with proper planning and surgical technique, elective TKA can be performed with safe, predictable results in patients whose BMI is greater than 30.

Notes:

12:18pm–12:24pm

Outcomes of Total Knee Arthroplasty in Relation to Pre-Operative Patient Reported and Radiographic Measures: Data from the Osteoarthritis Initiative

Ran Schwarzkopf, MD, MSc
Timothy Kahn
Aydin Soheili

Introduction: Total knee arthroplasty (TKA) is the preferred surgical treatment for end stage osteoarthritis. However, substantial numbers of patients still experience poor outcomes. Consequently, it is important to identify which patient characteristics are predictive of outcomes in order to guide clinical decisions. Our hypothesis is that pre-operative patient reported outcome measures and radiographic measures may help to predict TKA outcomes.

Methods: Using cohort data from the Osteoarthritis Initiative, we studied 172 patients who underwent TKA. For each patient, we compiled pre and post-operative Western Ontario and McMaster University Arthritis Index (WOMAC) scores. Radiographs were measured for knee joint angles, femorotibial angles, anatomical lateral distal femoral angles, and anatomical medial proximal tibial angles; Kellgren and Lawrence (KL) grades were assigned to each compartment of the knee. All studied measurements were compared to WOMAC outcomes.

Results: Pre-operative WOMAC Disability, Pain, and Total scores were positively associated with post-operative WOMAC Total scores and were associated with improvement in WOMAC Total scores. For radiographic measurements, pre-operative joint angles were positively associated with improvements in post-operative WOMAC Total scores. Combined KL grades (medial and lateral compartments) were negatively correlated with post-operative WOMAC Disability and Pain scores and were positively correlated with improvements in WOMAC Total scores.

Conclusions: All pre-operative WOMAC scores demonstrated positive associations with post-operative WOMAC scores, while among the pre-operative radiographic measurements only combined KL grades and joint angles showed any correlation with post-operative WOMAC scores. Higher pre-operative KL grades and joint angles were associated with

better (lower) post-operative WOMAC scores, demonstrating an inverse correlation.

Notes:

12:24pm–12:30pm

Does Increased Topside Conformity in Modular Total Knee Arthroplasty Lead to Increased Backside Wear?

Ran Schwarzkopf, MD, MSc
Richard D. Scott, MD
Evan M. Carlson, MSc
John H. Currier, MSc

Introduction: Modular metal-backed tibia components allow surgeons intra-operative flexibility. However, they introduce a second bearing surface that is a potential site for particle generation due to relative motion between the polyethylene insert and the tibial base plate. Questions/Purposes Our hypothesis was that the tibio-femoral rotation normally accommodated on the topside of non-conforming modular polyethylene inserts result in torsional forces on more conforming inserts. These forces are transferred through the insert to the insert-to-tray interface leading to increased backside motion and increased backside wear.

Patients and Methods: The study included 70 explanted total knee inserts that were sent for evaluation to an established orthopaedic implant retrieval laboratory. All devices were implanted and retrieved by the same surgeon. Two different cruciate retaining insert options in the knee system were included: the Posterior Lipped Insert (PLI), which has a curved-on-flat articular geometry, and the Curved Insert (CVD), which has a more curved-on-curved conforming articular geometry. The composite backside wear depth for the insert as well as the volume of backside wear were measured and compared between groups.

Results: The mean linear backside wear rate for the PLI inserts was 0.017mm/yr, which was significantly lower than for the CVD inserts at 0.052mm/yr ($p < 0.001$). The mean calculated volumetric backside wear rate for the PLI inserts was 44mm3/yr, compared to 115mm3/yr for the CVD inserts ($p < 0.001$).

Conclusion: The study results confirm the hypothesis that the more conforming tibial inserts experienced a higher backside wear rate than the flatter designs. This supports the conclusion that, at least in modular total knee designs, higher articular conformity to address the issues of high bearing contact stress comes at a price: increased torque transmitted to the backside insert-to-tray interface.

Notes:

12:30pm–12:36pm

Does a Pathway Lead to Consistent Length of Stay for Total Joint Replacement Patients?

Avinash Chaurasia, MD
*Ran Schwarzkopf, MD, MSc

Introduction: The length of stay (LOS) of a patient following Total Joint Arthroplasty (TJA) has a substantial impact on hospital cost, patient recovery, and hospital-bed and resource availability. Many factors, such as day of surgery, time of day, medical comorbidities, and location of discharge may play a role in the LOS. The purpose of this study is to identify which factors predispose to a longer LOS and how accounting for those may allow for changes in future TJA surgery decisions to minimize LOS for TJA patients.

Methods: 109 consecutive patients who underwent elective total hip (THA) or total knee arthroplasty (TKA) were included in the cohort. Patients were grouped by surgery THA or TKA, and further divided into two groups: patients that were operated on Tuesday versus patients that underwent surgery on Thursday.

Results: There was no statistically significant difference between the LOS of the Tuesday THA (mean=2.63 days) and the Thursday THA (mean=3.05 days) patients and

between the LOS of the Tuesday TKA (mean=2.48 days) and Thursday (mean=2.8 days) patients. Other independent co-variables such as, BMI, Charlson Comorbidity Index score, age, and laterality of surgery had no statistically significant impact on LOS for THA or TKA. When grouping patients into two ASA score groups (either ≤2 or ≥3), the ASA 1 & 2 group (mean=2.37 days) had a statistically significant difference in LOS when compared to the ASA 3 & 4 group (mean=2.84 days). Patients who arrived to the Post-Anesthesia Care Unit (PACU) after 2 p.m. (mean=3.964 days) had a statistically significant difference in LOS when compared to those who arrived before 2 p.m. There was also a statistically significant difference between TKA patients' LOS who were discharged to their home (mean=2.39 days) and those discharged to a secondary care facility (mean=2.82 days). Additionally, there was a statistically significant difference between THA patients who received general endotracheal anesthesia (mean=3.29 days) and those who received spinal regional anesthesia (mean=2.52 days).

Conclusion: Undergoing surgery on Tuesday compared to Thursday did not affect LOS among our patient group; this was most likely due to the implementation of a pathway-lead service, along with ancillary staff that work over weekends; case managers and twice-a-day physical therapy sessions are held, even on weekends. It is evident that ASA score, location of discharge, time of arrival to PACU and type of anesthesia administered can help determine the LOS for a TJA patient. Scheduling patients with a lower ASA score and that plan to be discharged home for the morning may help decrease LOS. Surgical teams and anesthesiology teams should work hand-in-hand to ensure patient LOS is minimized following these guidelines.

Notes:

12:36pm–12:42pm

A Clinical Decision Support Tool to Predict Difficult Surgical Exposure in Aseptic Revision Knee Arthroplasty

Paul M. Lichstein, MD
Claudio Diaz-Ledezma, MD
David Ross, BA
Mitchell Maltenfort, PhD
Javad Parvizi, MD, FRCS

Introduction: Although the different types of surgical approaches for revision total knee arthroplasty (RTKA) have been amply described, current knowledge does not allow the surgeon to reliably anticipate neither a difficult exposure nor an extensile approach during RTKA. The Knee Society developed The Knee Society Index of Severity for failed total knee arthroplasty (KSIS) to illustrate components of a difficult exposure. The aim of this study was to utilize the KSIS criteria and create a clinical decision support tool for preoperative planning of revision TKA useful in the prediction of a difficult surgical exposure and the necessity of an extensile approach.

Methods: We studied a case series of 198 aseptic RTKA in which 10% presented a difficult extensor mechanism exposure. Utilizing regression model analysis of 18 preoperative variables we were able to identify independent predictors of a difficult exposure. These were then combined to produce a clinical decision support tool that generates case-specific guidance during the preoperative planning of RTKA.

Results: Of the 198 cases, only 19 (9.6%) had a difficult exposure of the extensor mechanism during revision surgery. Thirteen cases (6.6%) required lateral patellar retinacular release, four cases (2.0%) required rectus snip, one case (0.5%) required V-Y turndown and one case (0.5%) required tibial tubercle osteotomy. Independent predictors were preoperative range of motion < 70 degrees), prosthesis implanted, need for femoral augmentation, and female gender could be utilized to produce an effective tool for predicting the necessity of an extensile approach and guidance during preoperative planning of revision TKA.

Notes:

12:42pm–12:48pm

Engagement of PCL During Flexion with Custom TKR Implants

Ryan O'Shea, MD
Jeremi Leasure, MSeng
William Camisa, MSME
Katrina Tech
Jennifer M. van Warmerdam, MD
William A. McGann, MD

Introduction: Patient specific total knee implants are emerging as one of the latest advancements in arthroplasty. Range of motion is critical to the clinical outcome of a total knee arthroplasty. The aim of our study is compare the kinematics of intact and resected PCL in order to elucidate the role of the PCL with patient specific knee implants. We hypothesize that there is no difference in the kinematics of a PCL retaining knee compared to a PCL deficient knee.

Methods: Seven frozen human cadaveric knees were used in this study. Patient-specific TKR surgery was performed under the guidance of a board-certified orthopaedic surgeon fellowship trained in joint replacement (WM). Muscle-controlled squatted knee flexion was performed on all specimens in our custom-designed knee simulator based on the "Oxford rig" and "Tuebingen" machines. The knee was tested with the PCL intact and PCL resected.

Results: No statistically significant changes in kinematics were observed between the PCL intact and PCL resected groups**.**

Discussion and Conclusion: The results of our study indicate custom-designed total knee replacements exhibit a profound ability to stabilize the tibiofemoral joint through deep knee flexions with or without the presence of the posterior cruciate ligament. The clinical implications of our study are that current custom-designed knee replacements are optimized to maintain anterior stability of the femur during flexion and that may need further optimization to produce a similar stability for external rotation of the femur, especially during late flexion.

**The FDA has not cleared this drug and/or medical device for the use described in the presentation.* *(Refer to page 41).*

Notes:

Saturday, August 2, 2014

Concurrent Session 16 — Upper Extremity 2

Moderator: Robert R. Slater Jr., MD

12:00pm–12:06pm

The Design and Testing of Patient-Specific Jigs for Targeted Glenoid Component Positioning in Total Shoulder Arthroplasty

James Van den Bogaerde, MD
Ho Jin Lee, MD, PhD
Scott Porter, MD

Introduction: There currently exists no guide or technique to assist in accurate and reproducible placement of a glenoid component during total shoulder arthroplasty. The purpose of this study was to generate patient-specific glenoid targeting jigs for total shoulder arthroplasty and to evaluate the accuracy of jig-assisted glenoid implant placement.

Methods: We performed a cadaveric study using 6 human shoulders (4 left shoulder specimens and 2 right shoulder specimens). For each shoulder a custom polymer jig was fabricated with the aid of CT modeling software and a 3-D printer. Preoperative and postoperative CT scans were overlaid and the accuracy of jig assisted intended placement relative to actual placement of the glenoid implant was evaluated.

Results: For all specimens the mean difference of planned versus actual starting point was calculated to be 2.65 mm (SD = 1.04, 95% CI 1.56-3.74) with a mean difference in coronal trajectory (inclination) of 6.32° (SD = 3.86, 95% CI 2.27-10.36) and mean difference in axial trajectory (version) of 3.64° (SD = 2.03, 95% CI 1.51-5.78).

Conclusion: The use of our CT generated patient-specific glenoid targeting jig can reproducibly assist in glenoid component placement within a small margin of error from the planned placement. Further studies should be performed to assess the accuracy of standard, non-guided glenoid prosthesis placement.

Notes:

12:06pm–12:12pm

Readmission Rates Are Not Affected by Length of Hospitalization Following Total Shoulder Arthroplasty

Krysten Bell, MD
*Mark E. Mildren, MD
Wesley P. Phipatanakul, MD
Torrey Parrey, BS
Montri Wongworawat, MD

Introduction: While total shoulder replacement is generally successful, postoperative readmission in elderly patients remains a concern. We aim to (1) determine the overall risk of hospital readmission at 30 and 90 days, (2) assess association between length of stay and readmission risk, and (3) identify other factors associated with increased hospital readmission rates.

Methods: We performed a retrospective case control of patients 65 years of age or older having undergone primary total shoulder arthroplasty, excluding fracture cases. Of the 251 cases, we calculated risk of readmission at 30 and 90 days. At both time endpoints, cases of readmission were compared with those not readmitted. Factors of length of stay, age, sex, body mass index (BMI), American Society of Anesthesiologists classification (ASA), discharge disposition (home vs. SNF), and insurance status were analyzed for association with readmission risk.

Results: The overall risk of readmission was 1.2% and 3.2% at 30 and 90 days, respectively. There was no association between length of initial post-operative stay and hospital readmission at either interval. Other patient factors were not associated with increased hospital readmission.

Discussion and Conclusion: The risk of readmission is low, and our findings are similar to other reports. The odds of readmission at 30 and 90 days were not associated with post-surgical length of stay; similarly, no other patient factors increased rate of hospital readmission.

Notes:

12:12pm–12:18pm

Combining Biologic Therapies Increases Type I Collagen Content of Rotator Cuff and Biceps Tendon Explants

Jamie M. Fleming, BS
Joseph E. Sheppard, MD
Alfonso E. Ayala
Corey A. Benjamin
Christopher P. Geffre, MD, PhD
Bobby Dezfuli, MD
John A. Szivek, PhD

Introduction: Rotator cuff tears affect 30 to 50% of people over age 50 and are often accompanied by biceps tendon pathology. Improving management is critical, as post-operative failure rates range from 30 to 94%. Adipose derived stem cells (ASCs), fibroblasts, and platelet-rich plasma (PRP) have shown promise independently for tendon repair. This study investigated the effect of combining ASCs, fibroblasts, and PRP into a single therapy on the type I collagen content and cell count of tendon explants.

Methods: Samples of rotator cuff tendon, biceps tendon, dermal tissue, adipose tissue, and PRP were collected from human subjects undergoing reverse total shoulder arthroplasty. 25 tendon explants from 4 subjects were collected. ASCs and fibroblasts were isolated from adipose and dermal tissue, respectively. Tendon explants were divided into 5 groups: untreated, treated with PRP, or treated with a combination of PRP with autologous ASCs, fibroblasts, or both cell types. After 4 weeks, tendons were evaluated for type I collagen staining intensity and number of cells using Image J software. Results were analyzed with univariate ANOVA.

Results: Type I collagen staining was greatest with combined PRP, ASC, and fibroblast treatment, with an average pixel intensity of 35.75. The average pixel intensity of the additional groups was as follows: untreated: 26.65, PRP: 25.67, PRP with ASCs: 28.55, PRP with fibroblasts: 32.50. The number of cells per μm2 was not significantly different between groups.

Discussion and Conclusion: Combing ASC, fibroblast, and PRP therapy may increase tendon type I collagen content. ASCs increase fibroblast migration when co-cultured, indirectly increasing type 1 collagen production. Additionally, PRP contains PDGF, VEGF, FGF, TGF, and IGF, which promote collagen synthesis. Ultimately, the findings could impact

management of tendon pathology, as autologous ASCs, fibroblasts, and PRP are easily obtained with minimal associated morbidity.

Notes:

12:18pm–12:24pm

Outcomes of Ulnar Shortening Osteotomy for the Treatment of Ulnar-Sided Wrist Pain

Ryan Mitchell, MD
Frederick N. Meyer, MD

Introduction: This retrospective study investigated the long-term outcome of ulnar shortening osteotomy for the treatment of ulnar-sided wrist pain. The etiology of this pain included but was not limited to ulnar-carpal abutment, ulnar-lunate impingement, triangular fibrocartilage complex (TFCC) tears, Volar Intercalated Segment Instability (VISI) deformities or luno-triquetral instability. The purpose of the study was to investigate the long-term clinical outcomes of the ulnar shortening osteotomy for both pain relief and union of the ulnar osteotomy site.

Methods: Thirty-one patients who underwent ulnar-shortening osteotomy from 2001-2010 were respectively reviewed. Plain radiographs, MRI, or diagnostic wrist arthroscopy confirmed the diagnosis. Conservative treatment was initially tried, and surgery was performed if conservative measures failed to provide adequate pain relief. Mean age at surgery was 38 years and 4 months (17 years–68 years). Mean follow-up was 12 months (3 months–64 months). Outcome was considered successful if there was significant improvement of ulnar-sided wrist pain with radiographic union of the ulna at the osteotomy site.

Results: Twenty-six patients were followed until completion. Twenty-four patients went on to union at an average of 5.8 months (5 weeks-16 months). Two patients required a bone-growth stimulator but continued to union without additional surgical intervention. Two patients developed nonunion. One patient developed tendonitis of the extensor carpi ulnaris secondary to the plate and required removal following union. Of the 26 patients, 24 (92%) reported an improvement in pain following ulnar-shortening osteotomy. One patient (4%) reported no change in pain while one more patient (4%) said pain became worse.

Discussion and Conclusions: Ulnar-shortening osteotomy achieved good pain relief for ulnar-sided wrist pain with 93% union at the osteotomy site. We recommend ulnar shortening osteotomy as an option for providing good pain relief as well as improved function for a variety of causes of ulnar sided wrist pain.

Notes:

12:24pm–12:30pm

In-Patient Trends and Complications After Total Elbow Arthroplasty in the United States

Nathan Orvets, MD
Hanbing Zhou, MD
Gabriel Merlin, MD
Joshua Shaw, MD
Xinning Li, MD

Introduction: Total elbow arthroplasty remains to be one of the few treatment methods for rheumatoid arthritis and post-traumatic arthritis. Few procedures are performed each year and they are mainly concentrated at select centers around the country. There are few large studies describe the long-term survival of the total elbow arthroplasty and associated cost and complications. To our knowledge, there is currently no data describing the national trends of total elbow arthroplasties in the United States. The purpose of our study is to evaluate the current practice trends and associated in-patient complications of total elbow arthroplasty at academic centers in the United States.

Patients and Methods: We queried the University Healthsystems Consortium (UHC) administrative database from 2007 to 2011 for patients who underwent an elective total elbow arthrolasty, according to their ICD-9 procedure code 81.84. A descriptive analysis of demographics was performed

which included patient age, sex, race, and insurance status. Next, a similar analysis of patient clinical benchmarks was performed, including hospital length of stay (LOS), hospital direct cost, in-hospital mortality, complications, and 30-day readmission rates.

Results: Our cohort consisted of 3,146 adult patients who underwent a total elbow arthroplasty at 159 different academic medical centers across the country during the specified time period. The annual surgical volume for individual surgeons who performed this procedure was 7 +/- 5. The cohort was comprised of 36.5% male and 63.5% female patients. The majority of the cohort 2,334 (74%) was white, 285 (9%) were black, 236 (7.5%) were Hispanic, 16(0.5%) were Asian, 9% were other. The mean age of the cohort was 58 years old +/- 17. Overall, 51% of the cohort had private insurance, 41% had Medicare, and 8% had Medicaid. At least 70% of the cohort had one or more chronic medical conditions. The mean LOS for the cohort was 4.2 days +/- 5. The mean total direct cost for the hospital was $16,300 +/- 14,000 per case. In hospital mortality was less than 1% for the cohort during their index hospitalization. Inpatient complication rate included: DVT 0.8%, re-operation 0.5%, and infection 0.4%. There was a readmission rate of 6.4% within the first 30 days from the time of discharge.

Discussion and Conclusion: Total elbow arthroplasty is associated with low in-patient complications that include DVT (0.8%), re-operation (0.5%), and infection (0.4%). However, a significant number of patients were readmitted to the hospital within 30 days of the index procedure (6.4%). Majority of the patient population is female that had either private insurance or Medicare. Hospital stay average to 4 days with a cost of $16,300 +/- $14,000 per case.

Notes:

12:30pm–12:36pm

Collagenase Injection for Dupuytren's Contracture in the Anticoagulated Patient

J. Grant Zarzour, MD
Frederick N. Meyer, MD
Mark Prevost, BS

Introduction: Collagenase clostridium histolyticum injections are used as a safe alternative to surgical intervention for the treatment of Dupuytren's contracture. It has been proposed that patients on the drug warfarin are at a higher risk for post-injection complications, such as bleeding, skin tears, and pain. The purpose of this study is to compare the complications of collagenase injections on patients currently taking warfarin with patients not receiving anticoagulant therapy.

Methods: A retrospective review was conducted on collagenase injections performed by the same surgeon from March 2010 through March 2013. All patients had a palpable cord and received an injection of clostridium collagenase followed by manipulation of the affected digit. Complications were recorded for all patients.

Results: A total of 107 injections were performed on 74 patients. There were 93 injections given to 68 patients who were not on warfarin. Complications for these 68 patients included bruising (68%), skin tears (29%), and pain (10%). There were 14 injections given to 6 patients who were taking warfarin. Complications for these 6 patients included bruising (57%), skin tears (21%), and pain (21%). There were no infections in either group.

Discussion and Conclusion: Patients receiving collagenase clostridium histolyticum injections while currently taking the drug warfarin do not demonstrate any significant difference in complications compared to patients not receiving anticoagulant therapy.

Notes:

12:36pm–12:42pm

Pullout Strength and Stiffness of a Non-Metallic Suture Anchoring System for Repair of the Central Slip of the Extensor Mechanism at the Proximal Interphalangeal Joint

Elizabeth Mikola, MD
*Evan Baldwin, MD
Christina Salas, PhD
Justin Brantley, BS
Aaron Hoblet, MD
Jenna Godfrey, MD

Introduction: We present a biomechanical study investigating pullout strength and stiffness of a non-metallic soft anchor system for repair of the central slip of the extensor mechanism at the proximal interphalangeal joint.

Methods: 2 fingers (index, middle) from each of 10 matched pairs of cadaveric hands are used in this study. Specimens are divided in two groups with two fingers from one limb prepared with a 1.4 mm soft anchor loaded with #1 suture (n=20). In the contralateral limb, a bone tunnel is created and threaded with #1 suture (n=20). The distal phalanx is potted in bone cement and fixed to the base of a servohydraulic testing machine. The suture is fixed to the linear actuator using flat grips. Specimens are tested at a rate of 100mm/min to failure.

Results: No significant difference was found between index and middle finger specimens for the anchor or suture groups. Mean ultimate load and stiffness for the anchor was 52.6+-18.3 N and 10.4+-2.6 N/mm, respectively. Mean ultimate load and stiffness for the suture was 90.5+-18.7 N and 16.2+-3.1 N/mm, respectively. All anchors failed by pullout from bone. All sutures failed by breakage.

Discussion and Conclusions: Failure of the soft anchor system would occur through pullout from bone prior to suture breakage. Anchor results compare favorably with previously published data on metallic anchors and horizontal mattress suture techniques (UL=30.2N and 32.5N, respectively) which show failure would likely occur at the bone/tendon interface before soft anchor pullout occurs. Additionally, early motion (~290g extension force) after treatment for finger injuries has been shown to improve outcomes by preventing tendon adhesions. The all-suture anchor construct would likely provide strength to allow early short arc motion since its load to failure was 52.6 N (5300g; 18 times larger in our study).

Notes:

12:42pm–12:48pm

Damage in the Distal Radius Following Treatment for Extra-Articular Fractures (AO 23-A3.2) Using Two-Column Volar Plates

Deana Mercer, MD
*Evan Baldwin, MD
Christina Salas, PhD
Justin Brantley, BS
James Clark, MD

Introduction: The purpose of our study was to characterize the damage accumulated in bone/implant constructs using two-column volar distal radius plates during a simulated post-operative healing period.

Methods: Ten matched pairs of fresh-frozen, cadaveric distal radii were used. A 1cm wedge osteotomy simulating an AO type 23-A3.2 fracture was created 1.5cm proximal to the distal articular surface. Group I specimens were treated with a volar plating system that provides a dual head design for independent two-tier subchondral scaffolding. Group II specimens were treated with a volar plating system that provides a single head design for enhanced ulnar buttressing. Specimens were sinusoidally compressed with 50-250N, at a rate of 1Hz for 5,000 cycles to simulate a 6 month healing period. Damage, which defines the period between a state of material perfection and the onset of crack initiation, was calculated from hysteresis data at every 500th cycle. Constructs not failed during cyclic loading were subject to a ramped load to failure at 1 mm/s.

Results: Group II specimens experienced significantly more damage under cyclic loading than group I specimens. (0.78+-0.11 and 0.66+-0.10, respectively) Group I specimens were significantly stiffer than group II specimens (481.47+-161.37 N/mm and 337.90+-112.04 N/mm, respectively). Ultimate force at failure in Group I (1268.50+-307.69 N) and Group II

(1025.63+-496.45 N) specimens was not significantly different.

Discussion and Conclusion: Structural damage, through greater in Group II specimens during low cycle loading, did not significantly affect the ultimate failure force of the constructs. Thus, if a patient is subject to high impact loading of the distal radius (fall on outstretched hand) prior to the end of their post-operative healing period, both implants may provide equivalent resistance to fracture. Should the post-operative healing period be delayed, it is likely that increasing damage may lead to fracture in Group II implants.

Notes:

12:48pm–12:54pm

Pegged Posterior Augmented Versus Non-Augmented Glenoids: A Biomechanical Evaluation

Tim Wang, MD
Geoffrey Abrams, MD
Emilie V. Cheung, MD
Anthony Behn, MS

Introduction: Posterior-augmented glenoid components have been introduced to address posterior glenoid wear deformity seen commonly in shoulder osteoarthritis. However, few studies have evaluated the biomechanical stability of these prostheses as compared to standard implants. We hypothesized that a posterior-augmented component would demonstrate similar edge displacement and loading as compared to a non-augmented glenoid.

Methods: Using synthetic scapulae (Sawbones, Vashon, WA, USA), 12o of posterior glenoid wear was created in all specimens. In group 1, glenoids were corrected to 8o of posterior wear and an 8o pegged posterior-augmented glenoid was cemented. In group 2, version was corrected to neutral and a standard pegged glenoid was placed. Testing was performed according to ASTM Standard F2028-08 and included cyclic loading to 100,000 cycles in the superior-inferior direction. Comparisons were made with Student's t-tests and alpha set at 0.05.

Results: During inferior loading, mean edge displacement (Group 1 vs. Group 2) increased from 0.43 vs. 0.26mm at cycle 1 to 0.79 vs. 0.79mm at cycle 100,000 for the inferior marker and 0.18 vs. 0.25mm at cycle 1 to 1.09 vs. 1.26mm at cycle 100,000 for the superior marker. During superior loading, mean edge displacement increased from 0.23 vs. 0.03mm at cycle 1 to 1.07 vs. 1.19mm at cycle 100,000 for the inferior marker and 0.57 vs. 0.37mm at cycle 1 to 0.61vs 0.77mm at cycle 100,000 for the superior marker. Mean inferior edge loading and mode of failure was similar between groups.

Discussion: No significant differences in edge displacement, edge loading, or qualitative mode of failure were seen between pegged posterior augmented and neutral glenoids. The use of both posterior glenoid and asymmetric reaming appear to be appropriate techniques for correction of moderate posterior glenoid wear.

Notes:

Western Orthopaedic Association

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July 31 – August 2, 2014

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Poster Abstracts

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Poster 1

Outcomes of Proximal Row Carpectomy and Scaphoid Excision with Four-Corner Arthrodesis in Patients Undergoing Concomitant Posterior Interosseous Neurectomy

Zahab S. Ahsan, BS
Jeffrey Yao, MD

Introduction: Posttraumatic arthritis following scaphoid trauma is a common clinical entity with progression to scapholunate advanced collapse/scaphoid non-union advanced collapse (SLAC/SNAC) arthritis. Accepted salvage procedures for advanced SLAC/SNAC are proximal row carpectomy (PRC) and scaphoid excision with four-corner arthrodesis (4CA). Minimal subjective or objective differences between the two procedures have been reported. The goal of this study was to evaluate clinical outcomes of these procedures at our institution with a concomitant posterior interosseous neurectomy (PIN) as a supplementary pain-relieving procedure.

Methods: A retrospective review of medical records was conducted identifying all patients that had undergone posterior interosseus neurectomy. Among these patients, concomitant procedures were further stratified into PRC and 4CA for definitive management of SLAC/SNAC pathology, with a minimum follow-up duration of 24 months. Intraoperative findings were reviewed and follow-up range of motion (ROM) and grip strength data were obtained. Patients were contacted to obtain Disabilities of the Arm, Shoulder, and Hand (quickDASH) and Patient-Rated Wrist Evaluation (PRWE) for long-term assessment of functional outcomes.

Results: Eleven patients underwent PRC with PIN with an average follow-up of 56 months (range, 28-75). Subjective functional assessment yielded averages for quickDASH of 10.3 and PRWE of 24.2. Thirteen patients underwent 4CA with PIN with an average follow-up of 51 months (range, 24-84). The mean quickDASH and PRWE for those patients was 8.8 and 19.0. No complications were noted in either patient cohort.

Discussion and Conclusion: Clinical outcome measures of PRC and 4CA with PIN did not yield a significant difference at long-term follow-up. Patients displayed a high level of functionality and minimal disability as evidenced by standardized questionnaires. Limitations of this study are inherent to the retrospective nature of this analysis and the relatively small sample size. Further studies are merited to examine the salvage procedures for SLAC/SNAC arthritis with or without concomitant neurectomy.

Poster 2

Trends in Femoral Neck Fracture Management from 1998 to 2010

Julius A. Bishop, MD
Arthur Yang, MS
Alex Sox-Harris, PhD

Introduction: With recent randomized controlled trials showing improved outcome with total hip arthroplasty as compared to hemiarthroplasty for femoral neck fracture management in elderly patients, we examined trends in femoral neck fracture management over the last 12 years.

Methods: Using data from the National Inpatient Sample (NIS) database, we identified patients treated for femoral neck fracture between 1998 and 2010 with either total hip arthroplasty (THA), hemiarthroplasty (HA), or internal fixation (IF). We examined trends in treatment over time as well as demographic variables such as patient age, gender, and socioeconomic status as well as hospital characteristics.

Results: Our cohort consisted of 334,929 femoral neck fracture patients treated with one of the three procedures between 1998 and 2010. Overall, we observed statistically significant increases in the rates of THA and HA (THA: 5.8% to 6.7%; HA: 62.3% to 63.9%), while rates internal fixation decreased (32.0% to 29.4%). Utilization of THA varied based on patient age, with significant increases occurring in age groups 0-49 years (1.5% to 5.5%), 50-59 years (5.9% to 14.0%), 60-69 years (6.3% to 12.6%), and 70-79 years (6.3% to 7.9%). Con-

versely, patients in age groups 80-89 years (5.8% to 5.0%) and 90-119 years (5.4% to 3.2%) showed a decreasing trend for THA utilization. Other variables studied were not related to rates of THA.

Discussion and Conclusion: Rates of THA for the treatment of femoral neck fractures increased between 1998 and 2010 in patients younger than 80 years of age, suggesting that surgeons are responding to mounting clinical evidence that THA is superior in these circumstances. This is the first study to demonstrate a change in practice pattern in response to this clinical evidence.

Poster 3

Falls from the United States Border Fence: An Analysis of Lower Extremity Injury

David R. Burk, MD
Lynn Gries, MD
John T. Ruth, MD

Introduction: Falls from height are a common cause of emergency department visits nationally. To date, no previous authors have described patterns of lower extremity injuries sustained in falls from the United States Border Fence. The goal of this project was to examine the nature of border fence related falls and associated injury patterns affecting the lower extremities.

Methods: Trauma department activation records between February 2004 and February 2010 from our institution were reviewed to identify activations related to falls from the United States Border Fence. Radiographs were independently reviewed by a musculoskeletal trained attending radiologist and orthopaedic surgery resident. Fractures of the axial skeleton or upper extremities were excluded. Fractures were classified according to anatomic location and presence of an open fracture.

Results: During the study period, 99 women and 92 men (mean age 30.7 years, min=11 years, max 56 years) who sustained fractures during a fall from the border fence were identified. 145 fractures were observed in the lower extremities. Rotational ankle injuries occurred most frequently in 44 patients and were open in 32% of the ankle injuries observed. Tibial pilon and diaphyseal tibia fractures were identified in 22 and 18 patients, respectively. These injuries were found to be open in 46% and 67% of cases.

Discussion: Overall, 145 fractures of the lower extremities were observed in patients presenting to our institution after a fall from the United States Border Fence. Open fractures were present in 30% of patients. Rotational ankle injuries were most frequently observed followed by tibial pilon, diaphyseal tibia, calcaneus, tibial plateau, and diaphyseal femur fractures.

Poster 4

A Critical Analysis of Pre-Operative Diagnostic Imaging for High Shear Angle "Vertical" Femoral Neck Fractures in Young Adult Patients: A Multicenter Study

Cory A. Collinge, MD
Robert Reddix, MD
Hassan R. Mir, MD

Introduction: Management of vertical femoral neck fractures in young adults is challenging and clinical outcomes range widely. Recent study has shown that typical fracture morphology for this injury is more complex than previously recognized (e.g. fracture orientation, comminution, loss of the calcar's cortical buttress) and in many cases surgeons appear to have proceeded to surgery with radiography that would limit one's understanding of the injury pattern or the ability to optimize a pre-operative plan for that injury. This study is designed to investigate the pre-operative radiographic work-up for young patients with vertical femoral neck fractures at a number of tertiary trauma centers.

Methods: This is a retrospective, multicenter study of all patients 18-49 years of age at two level I and one level II regional trauma centers (blinded) with a surgically repaired, Pauwels' type III, high shear angle (>50°) femoral neck fracture between January 1, 2007, through December 31, 2010. We evaluated static and/or dynamic plain radiography of the pelvis/ hip for presence and adequacy (defined as ability to reasonably define a vertical fracture angle and comminution, if present) and CT for presence (trauma or dedicated hip scan) and whether multiplanar reformatted reconstructions were available or not. Characteristics of the pre-operative radiographic work-up of these cases at the three trauma centers studied were compared, as well to assess for institutional variations.

Results: Sixty-three patients met all criteria for inclusion. Adequate plain radiographs of the hip or pelvis were found in 37 patients (59%); with 54%, 72%, and 62% adequate studies

noted at the three respective institutions (P= 0.16). Dynamic plain radiographs (traction-internal rotation views) were seen in only 2 patients at one center (3% overall). CT scans were performed on 35 patients (56%) overall, with CT's done in 57%, 56% and 55% of patients at the respective centers (P = 0.68). CT's appeared to be trauma scans in 90% of cases. Multiplanar reformats were available for 69% of all CT scans and for 38% of all patients (33%, 44%, and 38% per institution, respectively).

Conclusions and Discussion: This study showed that young adult patients with high-angle femoral neck fractures are often taken to surgery without adequate or all obtainable modern diagnostic imaging. These findings suggest that surgeons may be frequently unable to create an optimal pre-operative plan with available data. This may potentially affect treatment outcomes in this at-risk subset of patients.

Poster 5

Anatomical Relationship Between the Spermatic Cord and the Pubic Tubercle: Are We Harming the Cord During Symphyseal Repair?

Cory A. Collinge, MD

Introduction: Classic teaching for repair of the disrupted pubic symphysis includes application of pointed clamps to the pubic tubercles and pubic body for fracture reduction. Recent studies have reported rates of sexual dysfunction of 45-90% after repair of these injuries. The purpose of this study is to define the positional anatomy of the spermatic cord relative to the pubic tubercle and other local anatomy to assess the risk for iatrogenic injury during clamp placement.

Methods: Five intact fresh male human cadavers were dissected. A window of skin and subcutaneous tissue was excised exposing the low abdominal wall and penile root. Pubic tubercles were identified by palpation and marked. The spermatic cord was identified at the superficial inguinal ring and followed into the scrotum; any abnormalities of the cored were recorded. The relationships and distances of the spermatic cord to the pubic tubercle, insertion of the inguinal ligament and abdominal wall musculature, pubic symphysis, were recorded. Photographs were taken of the superficial and deep anatomy. Finally, the spermatic cord was opened to identify and document its contents.

Results: The spermatic cord was found following a consistent course after exiting the inguinal canal at the lower abdomen. It coursed inferomedial toward the pubic tubercle where it lay adjacent lateral to the tubercle at an average of 14mm (range 8 to 21mm) inferomedial to the superficial inguinal ring. The average distances from the spermatic cord to the pubic tubercle was 0.8mm (range, 0 to 2mm) and to the pubic symphysis was 26mm (range, 23-31mm). Qualitatively, even with direct visualization, it was not feasible to apply a pointed tenaculum to the pubic tubercles without piercing the spermatic cord, without manually retracting the latter.

Discussion and Conclusions: The spermatic cord is located lateral and immediately adjacent to the pubic tubercle after it exits the inguinal canal and passes into the scrotum. As such, the spermatic cord appears at significant risk for injury if pointed forceps are placed on the tubercles such as is often performed during the repair of pubic diastasis.

Poster 6

Skeletal Injuries Arising from Moped and Motorcycle Collisions

John Dupaix, MD
Mariya Opanova, MBBS
Caesar Ursic, MD

Introduction: Motorcycle and moped injuries remain a significant cause of motor vehicle related morbidity and mortality. There is a paucity of literature describing the skeletal injuries of moped riders and how these compare to those of motorcycle riders, however. The purpose of this study is to describe the skeletal injuries sustained in such incidents by vehicle type and determine if there are significant differences.

Methods: Patients traumatically injured on powered two-wheeled vehicles between 2004 and 2007 were entered into a trauma registry along with their presentation and clinical course. This registry was then segregated by vehicle type and reviewed for riders who sustained injuries of the appendicular skeleton, bony pelvis and spine. Injuries were then classified by bone injured. Additional data including gender, age, helmet use, head injury, facial fracture, ISS and mortality were extracted.

Results: 406 of 578 motorcyclists, 197 of 357 moped riders and 62 of 92 dirt-bike riders entered in the trauma registry sustained fractures of the appendicular skeleton, pelvis and or

spine. Motorcyclists had a significantly higher ISS score upon presentation and were more likely to die within the first hospital day. They also sustained significantly more skeletal injuries than moped riders, more fractures of the upper extremity (hand, radius, ulna, scapula) in addition to significantly more fractures of the spine, pelvis and foot. In contrast, moped riders were more likely to sustain significant head injuries and facial fractures. This was associated with a significantly lower rate of helmet use.

Discussion and Conclusion: While both moped and motorcycle riders share a risk for injuries of the lower extremity, their overall pattern of injury differs. Motorcycle riders appear to be at increased risk for more severe injuries and injuries of the upper extremity, spine and pelvis, while moped riders are at increased risk for significant head and facial injury

Poster 7

The Results of Partial Retention, Limited Debridement, and Immediate Limited Exchange in the Treatment of Newly Infected Total Joints

John Eagers, MD
Gerhard E. Maale MD

Introduction: Results from the one stage management of infected total joints are similar to the 2 stage treatments, when adequate debridement has been preformed. With the use of a dirty and clean side preparation in the OR, reduction of contamination at the time of reimplantation has been reported. To eradicate the biofilm mediated infection, complete removal all dead tissues both hard and soft, hardware and other particulate matter is necessary. The use of antibiotic loaded cement for prosthetic fixation, as well as, the use of antibiotic loaded calcium sulfate pellets have demonstrated high local concentrations of the antibiotic, at biofilm inhibitory levels, for up to 2 weeks. There are cases where because of the patient's comorbidities, large prior resections, and reconstructions where only limited debridements and partial retention of the prosthesis is desirable, where amputation at a multiplicities of levels is the only alternative.

Methodology: 10 cases of infected total joints were reviewed where incomplete removal of a prosthesis, around the hip or knee were reviewed with 2 year follow-up. Candidates were newly diagnosed infections with large pelvic reconstructions, good fixated femoral or tibial stems. Infections were diagnosed clinically or histologically. In all cases, the patients were staged pre-op. Surgical debridement was thorough. The retained prosthesis was debrided back to normal tissue, and mechanical washing with a brush followed by and argon beam laser was used to the exposed part of the infections, dual setups were used.

Results: 60% of the patients remain infection free. 2 patients required amputations and 2 are being suppressed. There was no correlation with culture. Free flaps were required in 4 patients.

Conclusion: Radical debridement with partial retention of a difficult to remove prosthesis, in cases acute infected joint arthroplasties, are preferable to amputation, with a 60% chance of eradication in single stage procedures.

**The FDA has not cleared this drug and/or medical device for the use described in the presentation.* *(Refer to page 41).*

Poster 8

Modified LPE Measurement vs. Actual Transfer Distance in Fulkerson Osteotomy Patients

Alan D.B. Edwards, BS
Evan P. Larson, BS
John P. Albright, MD

Introduction: To identify a correlation between tibial tubercle transfer distance and modified Lateral Patella Edge (LPE) measurement on quadriceps active extension MRI scans in patients undergoing Fulkerson Osteotomy procedures that use intraoperative femoral nerve stimuation for recurrent lateral patellar instability.

Methods: 24 Fulkerson Osteotomy patients' charts were reviewed retrospectively. Demographic data and final transfer distance were then collected from the operative note. A modified LPE was measured on preopertive quadriceps active knee extension MRI scans. A reference line was drawn tangentially to the posterior aspect of the femoral condyles at the deepest point of the intercondylar notch. A line perpendicular to the reference was then drawn through the apex of the lateral femoral condyle. The distance from the patella's center to its lateral edge was measured. Correla-

tion between lateral patellar edge measurement performed on quadriceps active extension MRI and actual tibial tubercle transfer distance were obtained by statistical analysis using IBM SPSS statistical software.

Results: There was a correlation of 0.655 of the modified LPE measurement with final tibial tubercle transfer distance. Statistical significance was achieved at an alpha set at 0.01.

Discussion and Conclusion: This Modified LPE measurement can be used as an accurate predictor of final tibial tubercle transfer distance needed to achieve maximal patellafemoral congruency in Fulkerson Osteotomy patients with a good volitional contraction of the quadriceps muscles on a quadriceps active extension MRI scan. Using this modified LPE measurement as an estimate for final tibal tubercle transfer distance can help archive maximum patellofemoral congruency in Fulkerson Osteotomy patients with intraoperative femoral nerve stimulation while decreasing operating room time and trauma to the patient. Further work is needed to determine what factors cause quadriceps active extension MRI scans to be unsatisfactory for use in performing this measurement.

Poster 9

Potential Barriers to Randomized Controlled Surgical Trials in Infants with Brachial Plexus Birth Palsy (BPBP)

Andrew Figoni, BS
Andrea Bauer, MD
Michelle James, MD

Introduction: The goals of this study were to determine whether parents of children who had reconstructive nerve surgery in infancy would have considered enrolling their child in a hypothetical surgical RCT designed to evaluate substitutes for sural nerve autograft as well as to discover whether or not these parents were bothered by the morbidity associated with sural nerve harvest and if their feelings correlated with their child's sex or race.

Methods: Parents of infants who sustained a brachial plexus injury at birth and received surgical treatment in infancy were given a questionnaire asking for their opinions regarding hypothetically enrolling their child in a research study and their assessment of the leg scars from the sural nerve harvest.

Results: Parents of 30 children agreed to answer the questionnaire. Twenty-nine parents indicated that they would hypothetically enroll their child in a research study with the most common reason given to help their own child. The parent who declined was concerned about the risks involved in enrolling in a study. The scars from sural nerve harvest bothered parents of 14 children; this did not seem to be associated with the child's sex or race.

Discussion and Conclusion: The majority of the parents we interviewed expressed a willingness to enroll their child in a hypothetical surgical RCT. However, the most common reason for this willingness was a desire to help their own child, demonstrating a fundamental misunderstanding of RCTs. Since sural nerve graft scars bothered approximately half of parents, it may be a worthy endeavor to determine the efficacy of alternate treatments. However, it is difficult for parents to recognize that RCTs are intended to improve knowledge rather than to benefit their child. Researchers must ensure that subjects understand this distinction before consenting to randomization.

Poster 10

Sports-Related Knee Strain and Sprain

Aaron M. Gray, BA
Keith T. Ellison, MD
William L. Buford Jr., PhD

Introduction: The epidemiology of athletic knee injuries has been described many times for highly specific cohorts, among them exclusive leagues and individual teams. Most of the cohorts studied for epidemiological purposes are mutually exclusive, making it difficult to provide meaningful comparison of athletic knee injury among sports and age and between sexes. It is important to understand the relative rates of knee injury for a variety of sports and ages as well as according to sex to better design risk prevention programs. In this report we describe the epidemiology according to sport, sex, and age of knee strain/sprain presenting to U.S. emergency departments in 2002-2011.

Methods: Raw data were obtained from the Consumer Products Safety Commission (CPSC) National Electronic Injury Surveillance System (NEISS) and the U.S. Census Bureau to estimate national rates of knee strain/sprain presenting to emergency departments by sport, sex, and age.

Results: Sprain/strain injury rates varied greatly by sport, sex, and age group. The highest injury rates for males occurred in football and basketball (among 12 popular sports, with football reported for males only). For females, soccer and basketball had the highest incidence (among 11 popular sports). The most at-risk population according to sex and age group (5-year increments for ages 5-34 years, plus the age group 35-44 years) was 15-19 years for both sexes.

Discussion and Conclusion: The study bridges the gap between type of sport, sex, and age to create a snapshot of athletic knee strain/sprain injury by using a single cohort. This information is presented in its entirety to allow such comparisons as noted to aid in planning and executing mechanism and prevention research. Additionally, it should provide relevant data to clinicians, coaches, and athletic trainers to aid in recommendations to athletes and for injury prevention.

Poster 11

Do HIV+ Patients Have a Higher Risk of Surgical Site Infections and Non-Unions After Operative Treatment of Closed Fractures?

Jiandong Hao, MD, PhD
Derly Cuellar, MD
Benoit Herbert, MD
David Hak, MD
Philip F. Stahel, MD
Cyril Mauffrey, MD, MRCS

Introduction: The hypothesis of this study is that the immune-deficient status of HIV-positive patients may contribute to increased postoperative complication rates compared to HIV-negative patients.

Methods: Retrospective observational cohort study of a prospective database at a single academic level 1 trauma center. IRB approval was obtained prior to chart review. Inclusion criteria consisted of all adult HIV-positive patients who underwent operative fracture treatment between January 1, 2001 and December 31, 2012. Demographic data included age, gender, ethnicity, social living status, comorbidities, date of HIV diagnosis, CD4+ cell count, modality of anti-retroviral therapy, tobacco or illicit drug intake, mechanism of injury, AO/OTA fracture classification, fracture fixation modality, time from surgery to fracture union, and postoperative complication rates related to surgical site infection and fracture-nonunion.

Results: A total of 42 HIV-positive patients who underwent surgical fracture fixation were identified during the 12-year study time-window. Of these, 17 patients were excluded due to incomplete medical records (n=15) or open fractures (n=2). The remaining 25 patients with closed fracture treated surgically (20 males and 5 females; mean age 46±11years, age range 20-67 years old) were included in the study. Within a 6 months period from the time of injury, 15 patients had a CD4+ cell count >200 and 5 patients had a CD4+ cell count < 200. Twenty-three patients (92%) were on antiretroviral therapy at the time of injury. Only one patient, with associated end-stage renal failure, developed a postoperative infection (4%). All patients achieved fracture-union within 180 days postoperatively, without the need for surgical revisions.

Conclusion: Our study suggests that HIV infection does not seem to correlate with a higher risk for the development of postoperative complication related to surgical site infection and fracture- non-unions after operative fixation of closed fractures.

Poster 12

The Internet as a Source of Information for De Quervain's Tendinitis

J. Casey Heap, BS
Bobby Dezfuli, MD
David Bennett, MD
Eric Chapman, MD
Gregory DeSilva, MD

Introduction: Many individuals are turning to the internet for information about health conditions. The purpose of our study was to evaluate the quality and readability of information about De Quervain's Tendinitis on the internet.

Methods: We chose the search terms "De Quervain's Tendinitis," "De Quervain's Tenosynovitis," and "De Quervain's Syndrome," and entered them into the three search engines "Google," "Bing," and "Yahoo" and compiled the search results. After exclusion criteria were applied, 74 unique websites remained. They were evaluated and assigned a quality score of 0-30 points, a Flesch-Kinkaid (FK) reading level, and a subjective quality score of 1-5.

The websites were then grouped according to the search term used, search engine used, and the order (priority) returned by the search engines. ANOVA analysis and pairwise comparisons were used to determine statistical significance amongst groups. Correlation analysis was also performed.

Results: The FK readability average was 10.3; above the recommended level. 49 percent of the websites were subjectively considered to be of good to very good quality, with the rest being fair, poor, or very poor. The search term De Quervain's Tenosynovitis returned the highest objective quality results (23.1/30 (mean)). There was no statistical difference found between the different search engines. The first ten results from the searches were of higher quality than results 11-20. There was a positive correlation between objective and subjective quality scores but no correlation between readability and objective quality.

Discussion and Conclusion: Reliable information about De Quervain's Tendinitis is available on the internet and is most likely to be found using the search term De Quervain's Tenosynovitis and in the first ten results of an internet search. However, nearly all of the information is written above the recommended 6th grade reading level.

Poster 13

Evaluation of Content and Accessibility of Websites for Accredited Orthopedic Trauma Fellowship Programs

Travis Hughes
Bobby Dezfuli, MD
Jordan L. Smith, MD
John T. Ruth, MD

Introduction: The Internet is widely used by medical students and residents for material on residency and fellowships. The Orthopedic Trauma Association (OTA) website serves as central hub for information on orthopedic trauma fellowships (OTF). This study aims to evaluate the accessibility and content of OTF websites.

Methods: We reviewed the information available on the OTA fellowship database and determined the accessibility of OTF websites through the links provided. Then, Google was searched using both program location and affiliated university, if applicable, to find direct links to websites with fellowship-specific information. Content was analyzed in two major areas: fellow recruitment and education/scheduling.

Results: Of 49 OTFs, the OTA database and Google searches combined to obtain thirty-nine websites that contained information specific to each OTF. The OTA database lists 49 fellowships; only seven programs (14%) provided links directly to fellowship websites, whereas the affiliated orthopedic department websites were linked directly for an additional 14 OTFs (29%). The majority of programs (57%) either did not provide links or provided non-functional links on the OTA website. Using Google search results, thirty-seven (76%) of 49 programs were identified. The number one search result led to fellowship specific websites for thirty programs (61%), with the remaining seven (14%) searchable OTFs linked within the top five results. The majority of websites (61%) showed sufficient information regarding fellow recruitment, while only fourteen websites (36%) provided a reasonable degree of information regarding fellowship-specific education and scheduling.

Discussion and Conclusion: The majority of accredited OTFs do not adequately utilize the Internet to provide easily accessible and complete information. More detailed information, especially regarding the role, education, and schedule of fellowship programs would be beneficial in allowing prospective candidates to more completely evaluate programs. The discrepancy in content and accessibility can hinder prospective fellows from appropriately evaluating fellowship programs.

Poster 14

Pediatric Access to Care — A Look at Orthopaedic Access in the State of Hawaii

Megan Kuba, MD
Byron H. Izuka, MD
Justin C. Grubbs, BS

Introduction: Access to children requiring orthopaedic services has been shown to correlate with insurance type and state insurance reimbursement rates. Children with Medicaid have less access to health care than do children with private insurance. Our study evaluated the availability of timely orthopaedic care to the pediatric patient with a broken arm who has public versus private insurance.

Methods: All orthopaedic surgeons, excluding those at Kaiser Permanente or Tripler Army Medical Center, currently practicing on the island of Oahu were selected. The main office number for each practitioner or group was telephoned with the following scenario: "My 10-year-old son broke his wrist 2 days ago; the fracture does not involve the growth plate. He was splinted and we were told to follow-up with an orthopaedic surgeon." Each office was called twice, a minimum of two weeks apart with the same scripted story except for the insurance status. During one call the child had a private PPO insurance, and during the other he had Medicaid.

Results: There are 28 private practices or group offices on Oahu. 50% of these providers gave an appointment to our hypothetical child within 1 week, regardless of insurance type. 68% of offices polled gave an appointment to the child with private insurance at an average of 1.3 days, as compared to 52% offered an appointment to the child with Medicaid at an average of 2.5 days. These differences were not statistically significant. 80% of those offices that would not give an appointment were able to recommend another provider who did.

Conclusion and Discussion: Previously published studies in other states have reported extremely poor access to care for the child with Medicaid. Our study indicates that in the state of Hawaii, insurance is not a significant barrier to medical care for children with a common orthopaedic injury.

Poster 15

One-Stage Exchange for Periprosthetic Joint Infection: Determining the Success

Paul M. Lichstein, MD
Kaveh Bashti, MD
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Javad Parvizi, MD, FRCS

Introduction: Surgical treatment of chronic periprosthetic joint infection (PJI) may involve one-stage or two stage exchange arthroplasty. One-stage exchange arthroplasty carries many recognized advantages compared to two-stage exchange but is believed by most North American surgeons to carry a higher rate of failure, dissuading them from adapting this as the surgical procedure of choice for treatment of PJI. The objective of this study was to conduct a systematic literature review and determine the success of one-stage exchange arthroplasty utilizing the recently published Delphi-based definition of successful PJI treatment.

Methods: A comprehensive literature review was conducted to identify all publications related to the outcome of one-stage exchange arthroplasty for treatment of chronic PJI. Inclusion was limited to articles published between1990 to 2012. Only studies with a minimum of one year follow-up were included. Outcomes and pertinent data were extracted to determine the success of the procedure using the recently defined Delphi criteria.

Results: 16 (639 patients) studies were identified. No studies reported on patient mortality, 14 (607 patients) did not report on early mechanical failure, 15 (621 patients) did not report on culture results of failed revisions, and 8 (252 patients) did not report on functional outcomes following reimplantation. In addition, 3 studies (154 patients) did not report on the utilization of oral antibiotics. The mean reported success of the one-stage exchange, being defined as retention of prosthesis, was 89% (range, 73% to 100%). Using the recently defined criteria for success that takes into account early mortality, early mechanical failure, and re-infection, there was insufficient data regarding mortality rate (16 studies) and early mechanical failure (15 studies), and thus the success rate of one-stage exchange arthroplasty was deemed to be 85%.

Discussion and Conclusion: As expected, the success of one-stage exchange arthroplasty is markedly lower when other important outcome parameters (other than prosthesis retention) are taken into account. Considering a high probability of selection bias for this procedure and lack of well-established clinical trials in the literature, further exploration of this surgical option may be warranted.

Poster 16

Surgical Treatment of Freiberg's Disease Using Intra-Articular Closing-Wedge Osteotomy: A Retrospective Analysis

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Steve Kurtz, PhD
Michael Rivlin, MD
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Introduction: The failure of sutures to effectively hold together a wound can be a devastating complication. The recent development of knotless barbed sutures offers the surgeon an alternative to traditional knotted closure methods.

Suture failure may occur due to knot loosening, suture pull-out, or suture breakage. Additionally, there may be variation in the number of knots tied. Therefore, a surgeon's knowledge of the performance of each type of suture is essential. The purpose of our study was to compare the biomechanical properties of knotless barbed sutures with traditional knotted suture materials.

Methods: Two sets of comparisons were done: 1) compared barbed polydioxanone (3-0, 0 and 2) to smooth polydioxanone (4-0, 2-0 and 1) and polyglactin (4-0, 2-0 and 1), 2) compared barbed poliglecaprone (3-0) to nylon (2-0) and poliglecaprone (2-0). Sizes selected for comparison were in accordance with manufacturer recommendations. Knotted sutures were tied with a surgeon's knot in a standardized manner with an increasing number of square half hitches from 1 to 5. All sutures were bathed in 0.9% sodium chloride for 30 seconds before fatigue testing.

Results: Overall, there was no significant difference in ultimate load between barbed polydioxanone suture and smooth polydioxanone or polyglactin of any size. Although there was no significant difference in the ultimate load between barbed poliglecaprone and nylon, the ultimate load of poliglecaprone was significantly greater than barbed poliglecaprone (37.3 N and 22.9 N respectively, p=0.005). The ultimate load of barded sutures was superior to all knotted sutures tied with less than a surgeon's knot plus two half hitches due to knot failure.

Discussion and Conclusion: Knotless barbed sutures display comparable biomechanical properties to traditional knotted sutures. However, the performance of knotless barbed sutures is superior to traditional knotted sutures tied with less than a surgeon's knot plus two half hitches.

Poster 17

Results of the First 29 Patients with 2 Year Follow-up with a Low Friction Anatomic, Locked and Constrained Total Knee

Gerhard E. Maale, MD

Introduction: Dislocation of present day hinged total knee joints, remains a problem particular in obese patients and patients with large soft tissue resections associated with wear and debris, tumors or treatment of infected total joints. Component wear continues to a problem with the non anatomic hinge with multiple moving parts, with failures occurring 5-10 years.

Methodology: The results of AMTi cycle testing of the new anatomic locked hinged knee and 2 year clinical results were analyzed. Implantation considerations were severe varus-valgus angulation, multidirectional instabilities, tumor, infected total knee, instability with primaries, and revisions with a large amount of wear and debris. Patient satisfaction, range of motion, and complications were reviewed. All patients had release of collateral and full posterior release.

Results: Cycle testing showed less wear than published primary total knees. Clinical results showed an average of 100 degrees of flexion and within 2 degrees of full extension. Satisfaction rate was high. 1 person required amputation for a persistent infection, 2 patients with wound complications developed arthrofibrosis and one ruptured a quadriceps mechanism with by a rock was revised to another prosthesis for infection. 2 patients had dislocation of the patella.

Conclusion: This novel hinged total knee prosthesis is low friction, has a good success rate at 2 years, should be indicated in a variety of complicated total knee joints, primary and revisions. Patella tracking and balancing is key for getting good results.

Poster 18

Multicenter Outcomes from Endoscopic Pubic Symphysectomy for Osteitis Pubis

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*Nicole A. Matsuda
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Benjamin G. Domb, MD

Introduction: Osteitis pubis (OP) is a form of athletic pubalgia associated with femoroacetabular impingement (FAI). Surgical options include open curettage and, more recently, endoscopic pubic symphysectomy. The purpose of this study is to determine outcomes from endoscopic pubic symphysectomy performed in the setting of FAI surgery.

Methods: A multicenter retrospective study was performed of 7 adult patients (4 male) of mean age 33 years with symptomatic FAI and OP that underwent arthroscopic surgery for the former and endoscopic pubic symphysectomy for the latter with mean follow-up of 2.8 years (1.8-5.0 years). Visual analogue scale (VAS), nonarthritic hip scores (NAHS), and

patient satisfaction were measured. Complications and revision surgeries were recorded and pre- and post-operative radiographs were assessed.

Results: Mean pre-operative VAS of 6.7 (8-4) improved to a mean post-operative VAS of 2 (7-0). Mean pre-operative NAHS of 50.2 (21-78) improved to a mean post-operative NAHS of 85.5 (41-99). Mean patient satisfaction was 8.3 (3-10). 2 male patients had post-operative scrotal edema which resolved spontaneously. There were no other complications. Pre- and post-operative radiographs demonstrated no anterior or posterior pelvic ring instability. 1 patient underwent pubic symphyseal arthrodesis because of continued pain.

Conclusion: As the first case series on this topic, endoscopic pubic symphysectomy offers a minimally invasive treatment with encouraging early outcomes that may be performed concurrently with surgery for FAI in co-afflicted patients. Scrotal swelling is a common complication.

Poster 19

Web Page Content and Quality Assessed for Shoulder Replacement

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Background: The Internet has become a major source for health related information. Clear, comprehensive, high quality information is necessary. This study aims to determine differences in the quality of information received when searching for total shoulder arthroplasty or shoulder replacement.

Methods: A total of 180 websites were examined with search engines, Google, Yahoo, and Bing. Two search terms were used, "shoulder replacement" (SR) and "total shoulder arthroplasty" (TSA) to determine the type and quality of information provided using the validated DISCERN instrument.

Results: When SR was used as the search tool, 48 unique sites were found. Of these, 48% provided patient-related information, 17% were health worker orientated, and 35% were "other." Average overall DISCERN score was 2.5 with 42% websites being classified as "good" with a DISCERN score over 3. Only 48% provided adequate information on benefits of each treatment, 42% described risks of each treatment, 46% discussed effect on overall quality of life, and 38% mentioned more than one treatment option. When TSA was used as the search tool, 53 unique sites were found; 34% provided patient-related information, 30% were health worker orientated, and 36% were "other." Average overall DISCERN score was 2.4 with 38% of websites being classified as "good." Only 43% provided adequate information on benefits of each treatment, 38% described risks of each treatment, 43% discussed effect on overall quality of life, and 40% mentioned more than one treatment option.

Conclusions: Overall quality of online information available was highly variable with the majority being poor and often incomplete, regardless of search term used. There was not a significant difference between search terms as many of the websites were duplicates. There is an opportunity to create more comprehensive online information materials related to shoulder replacement to better serve as a resource to physicians and their patients.

Poster 20

Anatomical Study Investigating Structures at Risk During Volar Percutaneous Scaphoid Fixation

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Introduction: The objective of this study was to evaluate, in a cadaveric model, anatomical structures at risk when utilizing the volar percutaneous approach for fixation of scaphoid fractures.

Methods: Fifteen fresh frozen cadaveric hands were utilized. Under fluoroscopic guidance, a 0.062 K-wire was percutaneously placed into the center-center position of the scaphoid, from the volar side of the hand, in the distal to proximal trajectory. We then carefully dissected around the scaphoid pin and measured the distance from the pin to adjacent anatomical structures at risk including the main radial artery, recurrent motor branch of the median nerve, first dorsal extensor compartment, superficial radial nerve, superficial branch of the radial artery and the flexor carpi radialis.

Results: We found that the structure most at risk is the flexor carpi radialis and the superficial branch of the radial artery. The average distances from the pin to the anatomical structures included 16.6 (±4.7) mm to the main radial artery, 15.9 (±4.6) mm to the recurrent branch of the median nerve, 13.6 (±4.1) mm to the first dorsal extensor compartment, 11.5 (±3.9) mm to the superficial radial nerve, 7.2 (±3.3) mm to the superficial branch of the radial artery, and 2.5 (±3.3) mm to the flexor carpi radialis. The guide pin passed through the flexor carpi radialis in 4 of the 13 specimens (31%) and was adjacent but did not pierce the tendon in 4 of the 13 specimens, and passed through the superficial branch of the radial artery in one of the specimens (8%).

Discussion and Conclusions: In agreement with previous studies, the neurovascular structure most at risk with a volar approach of percutaneous fixation is the superficial branch of the radial artery. The tendonous structure most at risk of injury with volar percutaneous pin placement is the flexor carpi radialis.

Poster 21

A Novel and Reproducible Anterior Portal for Arthroscopic Distal Clavicle Excision: An Anatomic Study

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Introduction: Acromioclavicular (AC) joint pain is a common cause of shoulder pain and dysfunction, and excision of the distal clavicle has been a reliable method for cases refractory to non-operative management. Arthroscopic distal clavicle excision (DCE) with differing portal entry sites has been widely described throughout the literature for both isolated acromioclavicular joint pathology and in association with other procedures. Although several modes of portal entry have been described, accessing the AC joint through a direct anterior portal is the mainstay for arthroscopic DCE as it allows excellent visualization, preservation of local anatomy, and direct access to the joint. Despite the utility, accurate placement of this portal is crucial. Specifically, the entry point should be in line with the plane of the joint, avoid damage to the coracoacromial (CA) ligament, and minimize damage to the superior and posterior acromioclavicular ligaments. Importantly, the portal should also allow placement of the arthroscopic burr such that it is able to reach the posterosuperior aspect of the distal clavicle for adequate resection. Despite the importance of placement of this portal, to date there have been no studies specifically describing the method by which to establish this entry site. Many studies reference this anterior portal, but fail to give specific landmarks by which the portal can be established. Subjectively, the authors have noted a reproducible way to delineate the entry point for this portal intra-operatively using clear and easily identified anatomic landmarks. The purpose of this study is to propose an anatomic description for establishing the anterior portal for arthroscopic distal clavicle excision. We hypothesize that such a portal exists that is both safe and reproducible using easily palpated surface landmarks of the shoulder.

Methods: Five cadaveric disarticulated shoulder specimens were obtained and examined in a laboratory setting at the University of Colorado School of Medicine Biomechanics Laboratory. Three specimens were right shoulders, and two were left. Sexes and ages were unknown. The surface anatomy of the specimens was examined and the palpable landmarks of the acromion, coracoid, scapula, and clavicle were labeled with a marking pen. The medial angle of the acromion was also palpated and marked. This was then traced along its length medially such that both the anterior border of the scapula and posterior border of the clavicle were encountered and marked. Marking the structures in the manner creates a "V" shape at Neviasser's Point on the superior aspect of the shoulder. The coracoid was then palpated anteriorly and marked along its length on the anterior aspect of the shoulder. Care was taken to identify the most lateral aspect of this structure. A line connecting the trough of the "V" at Neviasser's Point to the most lateral aspect of the acromion was then drawn. Along this line, a ruler was used to mark a distance 1.5cm distal to the anterior edge of the clavicle, which typically localizes the entry point to position just superior land lateral to the tip of the acromion. An anterior arthroscopic portal was made at this level and a sharp 5mm pin was inserted into the bursal space just below the AC joint to mimic the size of a 5mm arthroscopic shaver or burr. Following insertion of the pin, an open superior approach to the distal clavicle was performed to visualize its position. To determine the exact placement of the pin, a pre-calibrated digital goniometer was used to measure the angle of the pin to both the central aspect of the anterior and posterior AC joint, as well as the distance (offset) from the center of the AC joint in both the anterior and posterior positions. To ensure that the CA ligament was not violated and that local anatomy had been preserved, the anterior portal was further dissected to establish the position of the pin as it related to the coracoacromial ligament.

Results: The anterior portal described here provides access in such a manner that the average angle from the central portion of the AC joint anteriorly was 6 degrees (Range: 0-15 degrees). Average distance (offset) from the same point anteriorly averaged 3.2mm (Range: 0-9mm). Angles measured from the central portion of the posterior AC joint ranged from zero to seven degrees, with an average of 3.6 degrees. Posterior offset averaged 2.8mm (0-10mm). Dissection of the anterior portal demonstrated pin placement above the CA ligament in all five specimens, and that there was no iatrogenic damage to this structure either creating or utilizing the portal.

Discussion and Conclusion: This study demonstrates a safe, effective, and reproducible way to establish the anterior portal for arthroscopic distal clavicle excision. Critically, each established portal was above the CA ligament and all portals were within the width of a standard arthroscopic burr of the posterosuperior aspect of the distal clavicle – which is often the most difficult area to adequately access. Given these findings, this method of anterior portal placement to access the AC joint is both reliable and reproducible and has the potential to minimize technical error in specifically with regard to access of the posterosuperior distal clavicle in the setting of arthroscopic distal clavicle excision.

Poster 22

Proximal Femur Geometry in Total Hip Arthroplasty Patients

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Introduction: Accurate femoral prosthesis press fit depends on proximal femur size and geometry. We determined the variability of proximal femur size and geometry in patients who underwent primary THA and correlated the parameters studied with demographic factors and BMI.

Methods: We reviewed 127 patients who underwent primary THA from 2004-2009. Demographic data and BMI were collected. Intertrochanteric distance (IT), inner and outer diameters and cortical thickness for the subtrochanteric region (STO and STC), and inner and outer diameters of the cortical diaphyseal region (DPO and DPC) were measured from radiographs (adjusted for magnification) using a digital PACS system. Descriptive statistics were used to correlate patient demographic and body habitus data with radiographic measurements (multiple regression analysis, Pearson correlation coefficients, and ANOVA).

Results: Demographics of 96 THA patients studied were: 35% female; 75% Caucasian, 19% black, 6% Hispanic; mean age 60 years (range 22-91 years). Four patients (4.2%) were underweight (BMI less than 18.5 kg/m2), 13 (13.5%) normal weight (18.5-24.9), 34 (35.4%) overweight, and 45 (47%) obese (30 or more). No significant correlation was found for patient age or ethnicity and any radiographic measurement. Males had significantly higher proximal femur IT, SDO, STC, and DPO and DPC diameters and cortical thickness compared with females. BMI was significantly directly proportional to outer diameter and cortical thickness in both subtrochanteric and diaphyseal regions. There was a trend for BMI to be inversely proportional to inner diameter in these regions. No correlation was found between BMI and IT.

Discussion and Conclusion: Greater proximal femur geometry/size appears to correlate with sex but not with ethnicity or age. Larger subtrochanteric and diaphyseal outer diameters were significantly associated with greater BMI. A trend was found for larger subtrochanteric and diaphyseal inner diameters to be associated with lesser BMI. These findings may have implications for femoral implant design.

Poster 23

Results of the Oxford Phase 3 Mobile Bearing Medial Unicompartmental Knee Arthroplasty from an Independent Center: 467 Knees at a Mean 6-Year Follow-Up: Analysis of Predictors of Failure

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Introduction: Low bearing dislocation and revision rates have been reported from Oxford, while other series have had inferior results. We report on a large series of cemented Oxford Phase 3 mobile bearing UKA, and evaluate independent predictors of revision.

Methods: A retrospective review of 467 Oxford UKA's was performed with clinical and radiographic analysis. Indepen-

dent predictors of revision were evaluated including: gender, patient age, BMI, number of previous surgeries, surgeon volume, MIS vs non-MIS, cement type and technique, implant sizing, polyethylene design and thickness, cement type and technique, and degree of immediate postoperative mechanical axis correction.

Results: Thirty-eight knees (8.1%) were revised to TKA at mean of 49 months, most commonly for lateral compartment OA. The 5-year cumulative survival using revision to TKA was 98.5%. Revisions required short stems in 26% and augments in 21% of cases. The bearing dislocation rate was 0.64%. Correction of ≥3-5° from the preoperative alignment in a valgus direction (univariate analysis) and female gender (multivariate analysis) was predictive of revision. None of the other variables were significant.

Discussion and Conclusion: Our revision rate of 8.1% is comparable to other independent centers but not as favorable as from Oxford, and remains higher than in primary TKA studies. We found that ≥3-5° of correction from the preoperative alignment was predictive of revision and when this degree of correction is performed, female gender is cumulative in predicting revision. Thus correcting to a neutral mechanical axis as reported in other UKA studies is not always acceptable, and, in effect, correcting this far may be too much load on the lateral compartment for some knees. This argument has been reported recently in TKA surgery, and the results of this study confirm that the degree of correction in UKA surgery is predictive of future revision to TKA.

Poster 24

Shoulder Stabilization in the Overhead Athlete: A Systematic Review

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Introduction: Overhead athletes are particularly prone to the development of glenohumeral instability as a result of the forces placed on the shoulder during activities such as throwing. Current surgical management demands either an arthroscopic or open approach to shoulder stabilization, yet there has been limited work in understanding the outcomes of these different approaches specifically in the overhead athlete. The purpose of the present study is to determine which stabilization approach has better outcomes in the overhead athlete with anterior shoulder instability, with specific consideration to post-operative return to play, functional score outcomes, and recurrent instability.

Methods: MEDLINE and the Cochrane Database of Systematic Reviews were searched. 11 articles matched out selection criteria. These were assessed for methodological quality and data pertaining to overhead athletes was extracted and further evaluated.

Results: In overhead athletes with anterior glenohumeral instability, return to the same level of play (Grade 1: arthroscopic 72 ± 22.6%, open 68.7 ± 7.8%), diminished level of play (Grade 2: arthroscopic 24.2 ± 18.3%, open 34.5 ± 7.8%), and no return to play (Grade 3: arthroscopic 7.2 ± 10.8%, open 8.3 ± 14.4%) was similar between arthroscopic and open approaches. No significant difference in functional score outcomes existed between arthroscopic (UCLA 31.2 ± 2.7, Rowe 87.1 ± 10.3, Constant 80.9 ± 16.4) and open (UCLA 30.8 ± 0.6, Rowe 87.5 ± 6, Constant 77.2 ± 15.3) stabilization. Post-operative recurrent instability was significantly higher with arthroscopic (11.4 ± 2.8%) versus open (4 ± 1.4%) stabilization.

Discussion and Conclusion: Arthroscopic management of anterior glenohumeral instability allows overhead athletes to return to the same level of play as open stabilization, with comparable functional restitution as measured by functional outcomes scales. The higher rate of recurrent instability in arthroscopically treated patients may indicate a need for open revision in such athletes.

Poster 25

Current Practice in the Management of Adult Intertrochanteric Hip Fractures: A Survey of Orthopaedic Surgeons

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Introduction: The optimal implant for stabilizing adult intertrochanteric hip (IT) fractures remains controversial. The use of cephalomedullary nail (CMN) has increased despite a lack of evidence. We studied the opinions of orthopaedic surgeons with the aim of identifying current practice patterns and associated rationale.

Methods: A web based survey containing 20 questions was distributed to active members of the American Academy of Orthopaedic Surgeons eliciting information on surgeon demographics and preferred management strategies as well as rationale for decision making.

Results: 3,887 surgeons participated in the survey (20.4% response rate). 55.2% of surgeons trained using primarily SHS; whereas only 18.8% currently use primarily SHS to treat IT fractures. Surgeons who practiced in a non-academic setting (70.9 vs 58.1%), did not supervise residents (71.1 vs 61.3%), or treated more than 5 IT fractures a month (77.8 vs 67.2%) were more likely to use primarily CMN. Of the surgeons who used only CMN, ease of surgical technique (58.4%) was cited as the primary reason, while surgeons who used only SHS cite familiarity (44.4%), improved outcomes (37.0%), and ease of technique (16.0%) as their primary reasons. 28.5% of surgeons use only long CMNs, while 2.7% use only short CMNs. Of those who use only long CMNs, decreased risk of peri-implant fracture (73.5%) was the primary rationale. Of those who use only short CMNs, ease of technique (58.6%) and equivalency of outcomes (24.0%) were most frequently cited.

Discussion and Conclusion: CMNs are favored over SHSs across all experience levels and practice settings, with higher use among higher volume surgeons and surgeons in non-academic settings. There is also no consensus on the use of short versus long CMN in the treatment of IT fractures. Further research is indicated to better define the roles of SHS versus CMN as well as long versus short CMN.

Poster 26

Postoperative Pain Following Surgical Treatment of Ankle Fractures: A Prospective Study

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Introduction: Postoperative pain following fixation of ankle fractures has been reported to have a substantial effect on surgical outcome and patient satisfaction. Patients may require large amounts of narcotics and are at risk for long-term use of pain medications. Few prospective studies in the literature investigate patient pain experience in the treatment of ankle fractures.

Methods: We prospectively evaluated 63 patients undergoing open reduction internal fixation (ORIF) of ankle fractures regarding their pain experience. The Short-Form McGill Pain Questionnaire (SF-MPQ) was administered preoperatively and postoperatively. Preoperatively, patients scored their preoperative pain (PP) and anticipated postoperative pain (APP). The SF-MPQ was repeated at three days (3dPP) and six weeks (6wPP) postoperatively.

Results: There were no significant differences between PP, APP, and 3dPP, however 6wPP was significantly lower. There were significant correlations between PP and APP, as well as between preoperative and postoperative pain scores. PP and APP were independent predictors of 3dPP, however only APP was predictive of 6wPP. Gender, age, and inpatient vs outpatient status were not significant factors. There were no statistically significant differences in pain scores between fracture types.

Discussion and Conclusions: Preoperative pain severity is predictive of postoperative pain levels. Orthopaedic surgeons should place a greater focus on the management of patient pain and expectations prior to undertaking a surgical procedure. Further study is needed to determine whether these data apply to other foot and ankle and orthopaedic operations.

Poster 27

Development of a Simulator for Studying Kinematics and Kinetics of the Knee

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Introduction: Total knee replacement is a highly successful procedure with high rates of survivor ship on long term follow-up; however, patient satisfaction remains lower indicating a need for improvement. Posterior cruciate-retaining total knee arthroplasty sacrifices the ACL but leaves the PCL intact in an attempt to more closely mimic native kinematics. Previous investigations have shown PCL retaining implants

do not mimic native kinematics which may be the driving factor to the low satisfaction scores. The cruciate-substituting counterpart has been shown to exhibit even less similarities to native kinematics. Patient specific TKA designs are a promising technology that has been shown to closely match native kinematics and may be robust enough to stabilize deficient PCL knees.

Methods: We tested our hypothesis studying the biomechanics of the implant in seven cadaver knees with intact PCLs. Knee was mounted on an Oxford Rig and flexed to simulate squatting. Anterior-posterior translation, medial-lateral translation and internal-external rotation of the tibiofemoral articulation were recorded throughout flexion. PCL was subsequently transected and the procedure repeated for each specimen. Comparison between the PCL intact and deficient kinematics was carried out with a 2 way ANOVA test.

Results: We observed similar kinematic profiles between the intact-PCL and resected-PCL groups. We observed trends of anterior translation, medial translation, and decreased external rotation of the femur in late flexion in the absence of the PCL; however, these trends were not statistically significant. Further analysis of the overall behavior of the groups through analyzing the area under the flexion curves further illustrated little difference after PCL was removed.

Discussion and Conclusion: Our data indicate patient specific total knee replacements do not rely on the PCL for stability and constraint. The clinical implications of our findings suggest patients who present with deficient PCLs and receive patient specific TKR may not experience the instability inherent with traditional cruciate retaining designs.

Poster 28

Tibial Diaphyseal Fracture with Associated Ipsilateral Posterior Malleolar Fracture: A Frequently Missed Injury

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Introduction: In obvious fractures of the tibial diaphysis, a concomitant articular fracture involving the distal tibia may be missed. The purpose of this study was to review fracture characteristics in patients who underwent intramedullary interlocked nailing for tibial diaphyseal fractures with ipsilateral posterior malleolar fractures.

Methods: A retrospective review of all skeletally mature patients who sustained AO/OTA 42 fractures and underwent intramedullary interlocked nailing between January 2004 and May 2013 was performed. Patient and fracture characteristics were recorded.

Results: A total of 359 patients with AO/OTA type 42 who underwent tibial nailing were evaluated. Twenty-nine patients (8%) had a concomitant posterior malleolar fracture. Of these 29 patients, 22 (76%) were due to a low energy injury mechanism. Twenty-one of 22 patients (95%) had a spiral fracture of the tibia suggesting a rotational component to the injury. All high-energy injuries with a posterior malleolar fracture were associated with a transverse or an oblique tibial shaft fracture. The posterior malleolar fracture was not evident in 11/29 (40%) patients in primary ankle radiographs, but was diagnosed in 8 of 11 (73%) by a CT scan performed due to a high index of suspicion based on the mechanism of injury. The average size of the malleolar fragment was 35% of the articular surface of the distal tibia (range, 6-50%). The malleolar fragment was displaced and/or evident during nailing in 5 patients. There was no intra- or post-operative displacement in patients in whom the malleolar fragment was fixed percutaneously before nailing. Average healing time was similar to a routinely nailed tibial diaphyseal fracture without a malleolar component (~12-16 weeks).

Discussion and Conclusion: A posterior malleolar fracture is commonly associated with a low energy simple tibial shaft fracture with a spiral configuration. A high index of suspicion is required to diagnose this injury and the threshold for obtaining an ankle CT scan should be low. Fixation of the posterior malleolus should be done prior to nail insertion to prevent displacement.

Poster 29

Orthopaedic Injuries in Mixed Martial Arts

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Introduction: A paucity of literature exists regarding cause, and type in the mixed martial arts population. Current literature only focuses on competition injuries in professional fighters, where hand and facial injuries predominate. Our goal was

to determine what injuries were most prevalent among fighters of all levels during competition and training.

Methods: 36 mixed martial arts fighters of varying age and experience were surveyed during a one-on-one interview regarding injury history, injured body part and mechanism of injury. Only injuries that limited participation were documented. Demographic data regarding age and experience was also collected.

Results: The average age of the fighters was 29.4 years (range 17-46 years) with an average experience in martial arts of 7.5 years (range 0-30 years). 34 men and 2 woman were surveyed. 29 of the 34 participants had suffered a significant injury while training or competition. Overall a total of 85 injuries were documented. 75 of the injuries were sustained during training. 24 participants suffered multiple injuries. The most commonly injured body parts included knee (n=14), shoulder (n=10), lower back (n=9), neck (n=8), and elbow (n=7). The plurality of injuries were sustained during a take-down maneuver (n=31). Fighters over 30 sustained more neck and knee injuries than fighters under 30. Additionally professional fighters had sustained more injuries than amateur fighters.

Discussion and Conclusion: Most mixed martial arts injuries are sustained during training as opposed to formal competition. The most common maneuver causing injury to a practitioner is during a take-down. Knee, shoulder, lower back, neck, and elbow injuries are most common. These results differ from the current literature that focuses on mixed martial arts competition.

Poster 30

Trends in Ulnar Collateral Ligament Reconstruction and Associated Elbow Surgery

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Introduction: Minimal data exists as to the demographic variables of ulnar collateral ligament (UCL) reconstruction in the general population. The purpose of this study was 1) to elucidate trends in UCL reconstruction across demographic variables including age, and regional distribution, and 2) to document trends in concomitant procedures, specifically ulnar nerve transposition (UNT) and elbow arthroscopy.

Methods: A large national private insurance database was queried for patients with UCL reconstruction and for records indicating concomitant elbow arthroscopy and UNT. Patients were then stratified by year of surgery (2007 to 2011), 5-year age groups, and geographic region (South, Northeast, West, Midwest). X2 and Pearson correlation were used for statistical analysis.

Results: A total of 822 UCL reconstructions were performed from 2007 through 2011, with an average incidence of 2.49 per 100,000 patients. Stratification by age revealed significantly higher incidence of UCL reconstructions in the 15-19 year old age group compared to all other groups at 22.2 per 100,000 patients. This subset of patients demonstrated a significantly increasing trend from 19.6 to 25.3 per 100,000 patients from 2007-2011. Significance to all subsequent groups was found in the 20-24 year age group at an incidence at 12.4 per 100,000 patients. The percentage of UCL reconstruction cases performed in conjunction with elbow arthroscopy (10.5% in 2007 to 9.1% in 2011) and UNT (50.0% in 2007 to 40.3% in 2011) decreased over the study period. The Northeast and West regions demonstrated higher than expected incidences of UCL reconstruction, while the South demonstrated a lower than expected incidence.

Discussion and Conclusions: UCL reconstruction rose significantly from 2007-2011 among the subset of patients between 15-19 years old, indicating an increase in popularity in this group. Nearly 80% of the total UCL patients were 15-24 years old, demonstrating that UCL reconstruction was preferentially

Poster 31

Porous Metal Augments Show Excellent Mid-to-Long Term Survival in Complex Acetabular Reconstruction

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Introduction: One major challenge in revision surgery is reconstructing complex acetabular defects with insufficient

bone stock. Conventional cementless acetabular components may fail to provide ingrowth in cavitary and segmental defects with less than 50% host bone contact. Implant osseointegration is critical for achieving long-term stability of implants in acetabular revision, especially in the setting of severe bone loss. Porous trabecular metal (TM) augments provide a viable solution to deal with severe acetabular bone loss.

Methods: We followed 93-hips in 83-patients using TM augments. The average age at the time of surgery was 67.5-years, average follow-up was 64.8-months. Preoperative pelvic radiographs were used to categorize acetabular defects according to the Paprosky classification of acetabular defects. The clinical endpoint included measuring the number of total hip arthroplasties with stable acetabular implants at the most recent follow-up visit, and any postoperative complications.

Results: There were 2 Paprosky Type-IIA, 19 Paprosky Type-IIB, 15 Paprosky Type-IIC, 31 Paprosky Type-IIIA, 25 Paprosky Type-IIIB, and 1 Paprosky Type-IIIC defects. Kaplan-Meier rates of survival at 10-years was 98.9% and 96.8% using acetabular revision for aseptic loosening and revision for any reason as the endpoint, respectively. Three complications (3.23%) occurred in patients with underlying Paprosky Type-IIIB defects. These include 1-posterior dislocation, 1-heterotrophic ossification, and 1-aseptic loosening.

Discussion: Porous trabecular metal augments have provided excellent results in the setting of severe bone defects. This retrospective study demonstrated excellent mid-to-long term follow-up results with a mean follow-up time of 64.8 months using porous trabecular metal augments in severe acetabular defects. While we report excellent mid-to-long term results using TM augments, longer follow-up studies are needed.

Poster 32

Accuracy and Surgical Efficiency of Total Knee Arthroplasty with Patient Specific Instrumentation: Systemic Review and Meta-Analysis

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Introduction: Patient specific instrumentation (PSI) has allowed surgeons to use a more custom-fit approach for total knee arthroplasty (TKA). While proponents of PSI have claimed its superiority to conventional methods when pertaining to surgical efficiency and accuracy, the literature remains ambiguous to the overall benefits of PSI.

Methods: This systemic review and meta-analysis of English articles on PUBMED yielded 12 articles that compared outcomes of TKA using PSI to that of standard instrumentation (SI) by using post-operative coronal alignment and operating room time as primary outcomes. The values that were most consistently compared in these studies included: Hip-Knee-Ankle (HKA) angle, tibial coronal alignment (TCA) angle, femoral coronal alignment (FCA) angle, and operation time. The mean deviation from pre-operative target alignment and statistical outliers of the HKA angle, TCA angle and FCA angle were all recorded as well as the average operation time using each type of instrumentation. Outliers were defined in all studies as post-operative angles that deviated by more than 3 degrees from the pre-operative target alignment. Operation time was reported as the time between skin incision and skin closure.

Results: We found no difference in HKA angle, TCA angle or operation time between PSI and SI among the included studies. Regarding FCA angle, fewer outliers were observed using PSI compared to using SI.

Discussion and Conclusion: Our systemic review and meta-analysis showed no clinical difference between PSI and SI with respect accuracy and surgical efficiency. Further randomized comparative clinical trials are warranted to determine if PSI provides any clinical advantage over standard instrumentation with respect to long term outcomes.

Poster 33

External Fixation for the Treatment of Open Joint Injuries in Pediatric Burn Patients

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Introduction: We know of no reports on external fixation for treatment of open burn injuries in a pediatric population.

Methods: We reviewed the case logs of all orthopedic surgeons from 2000-2010 at a burn hospital to identify patients with open joints secondary to burn injuries.

Results: Nine patients who sustained open joint injuries after a burn and treated with a spanning external fixator (SEF) were identified. Characteristics of the burns included: 5 elbow, 4 knee, 2 of the latter with joint instability; 8 flame, 1 electrical; average total body surface area affected 49.4% (range 25%-79%); substantial third-degree burn in all patients. Average age at the time of the burn was 8.6 yr (range 2 mo-17.9 yr). Average time from the burn to SEF placement was 6.8 wk (range 3-10.5 wk). Before SEF placement, an average of 3.8 skin grafting procedures (range 1-7) were performed to treat the open joint injuries. SEFs remained in place for an average of 6.4 wk (range 3-9 wk). After SEF application, substantially fewer skin grafting procedures (average 0.8, range 0-3) were performed. The only complication considered to be directly associated with the SEF procedure was failure of fixation, likely due to undersizing and weakness of the construct. All other complications were considered likely due to the nature of the injury (e.g., heterotopic ossification, contractures). Postoperative rehabilitation records were not available for all patients.

Discussion and Conclusion: In our small retrospective case series on placement of an SEF for an open joint burn injury in children, the number of skin grafting operations was almost 5 times greater before fixation than after. We recommend early SEF to help assist with soft tissue healing and decrease the amount of skin grafting procedures in this population, especially given the small amount of authograft available.

Poster 34

Demographic Trends in Arthroscopic and Open Biceps Tenodesis

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Introduction: The purpose of this study was to evaluate the trends and report on the demographic and regional data of patients undergoing arthroscopic versus open biceps tenodesis.

Methods: A retrospective review of a commercially available database searchable by both Current Procedural Terminology (CPT) and International Classification of Diseases (ICD-9) codes was performed to identify cases of arthroscopic and open biceps tenodesis that were performed between 2007 and 2011 with concurrent diagnoses of twenty commonly associated shoulder pathologies. Each record provided the patient's age, gender, and region within the United States. 2 analysis was used to determine statistical significance with regards to age, gender, region, and trends over time.

Results: 9,011 patients underwent arthroscopic biceps tenodesis and 11,678 patients underwent open tenodesis between 2007-2011. 99.85% of cases of biceps tenodesis were performed open in 2007; however, by 2011 the practice of both procedures was relatively equal. Both arthroscopic and open biceps tenodesis were performed most commonly in the 50-59 year old age group representing 46.4% and 43.6% of the total cases respectively. Males were more common than females to undergo arthroscopic or open biceps tenodesis with 66.1% and 71.9% of cases occurring in males respectively. 49.8% of cases of arthroscopic biceps tenodesis and 44.6% of cases of open biceps tenodesis were associated with rotator cuff tears while only 14.4% of cases of arthroscopic biceps tenodesis and 16.2% of cases of open biceps tenodesis were associated with biceps tendinitis.

Conclusion: The number of cases of both arthroscopic and open biceps tenodesis increased each year from 2007-2011. The majority of cases of both arthroscopic and open biceps tenodesis were performed in patients aged 50-59 with both procedures being more common in males than females. Both procedures showed higher occurrence in association with pathologies of the rotator cuff rather than the biceps tendon.

Poster 35

Management of Periprosthetic Shoulder Infections: Is There a Role for Open Biopsy During Staged Treatment?

Alan L. Zhang, MD
*Brian T. Feeley, MD
Brian S. Schwartz, MD
Teddy T. Chung
C. Benjamin Ma, MD

Introduction: Periprosthetic shoulder infections are difficult to manage. Despite the gold-standard treatment of two-stage exchange arthroplasty, reinfection of implants can be as high as 37%. The purpose of this study is to describe a multi-stage protocol used at our institution to detect persistent deep shoul-

der infection despite two-stage treatment and subsequently decrease the recurrence of periprosthetic joint infections.

Methods: Patients who suffered periprosthetic shoulder infections were treated with a standardized protocol of irrigation and debridement (I&D), removal of implants, antibiotic cement spacer placement and pathogen-directed antibiotic therapy for six weeks. After completion of antibiotics and resolution of clinical symptoms, an open biopsy was performed in the operating room followed by revision arthroplasty at a later date if final cultures were without evidence of infection. If evidence of infection persisted then another course of I&D and antibiotic treatment was performed. ASES scores were used to evaluate clinical outcomes.

Results: Eighteen patients were included between 2005 and 2012. The most common pathogens isolated were Propionibacterium acnes (44%), Staphylococcus epidermidis (39%), and Staphylococcus aureus (22%). Four patients (22%) were found to have evidence of persistent infection on open biopsy and required subsequent rounds of I&D before replantation. Propionibacterium acnes was the infecting pathogen in 75% of patients with persistent infection and 38% of patients with P. acnes infection had recurrence. Mean follow-up of 24 months showed no signs of recurrent infection in any patient and an average ASES score of 71.

Discussion and Conclusion: Using our protocol for management of periprosthetic shoulder infections with open biopsy before replant of shoulder prostheses, we detected a persistent infection rate of 22% in all patients and 38% in patients with P. acnes infection despite prior two-stage treatment and resolution of clinical symptoms.

Poster 36

Proximal Humerus Fractures: An Analysis of Hospital Readmissions After Surgical Treatment

Alan L. Zhang, MD
*Brian T. Feeley, MD
William W. Schairer, MD

Introduction: With technological advances such as locked periarticular plating, hemiarthroplasty and more recently reverse total shoulder replacement, surgical treatment of comminuted proximal humerus fractures have become more commonplace in the United States. However, there is insufficient information on outcomes after surgery such as hospital readmission rates and costs, or factors contributing to readmission.

Methods: The State Inpatient Database (SID) from seven different states was used to identify patients who underwent surgical treatment for a proximal humerus fracture with either open reduction internal fixation (ORIF), hemiarthroplasty of the humeral head (hemiarthroplasty) or reverse total shoulder arthroplasty (RTSA) from 2005 through 2010. The database was used to measure the 90-day readmission rate, identify causes and risk factors for readmission and determine costs of treatment. Multivariate modeling was performed to evaluate factors associated with hospital readmission and risk was calculated using a cox proportional hazards model from a time-to-readmission analysis.

Results: 27,017 patients were included with an overall 90-day readmission rate of 14.4% (14.8% for treatment with ORIF, 14.5% for RTSA, and 13.4% for hemiarthroplasty). The majority of readmissions were due to medical causes (75%) but treatment with ORIF resulted in the most readmissions from surgical complications (29%). The most common surgical cause of readmission was mechanical complication (11%) after ORIF and dislocation after RTSA (9.6%) and hemiarthroplasty (4.5%). Risk of readmission was greater for patients who were female, African-American, discharged to a nursing facility, and had Medicaid insurance. The average total cost of treatment with ORIF was significantly lower than that of hemiarthroplasty or RTSA.

Discussion and Conclusion: Surgical treatment of proximal humerus fractures with hemiarthroplasty yielded lower hospital readmission rates than treatment with ORIF or RTSA. While the majority of readmissions were due to medical complications, treatment with ORIF resulted in the most readmissions from surgical complications.

Individual Orthopaedic Instruction/ Multimedia Education

Schedule:

Thursday, July 31, 2014	3:00 pm-5:00 pm
Friday, August 1, 2014	2:00 pm-4:00 pm
Saturday, August 2, 2014	2:00 pm-4:00 pm

The following AAOS DVDs are available for individual viewing at the above times.

1. **Anatomy of the Knee** (25 minutes)
   Stephen L. Brown, MD; Patrick M. Connor, MD; Donald F. D'Alessandro, MD; James E. Fleischli, MD

2. **Pectoralis Major Transfer for Irreparable Rotator Cuff Tears** (11 minutes)
   Sumant G. Krishnan, MD and Kenneth C. Lin, MD

3. **Surgical Dislocation and Debridement for Femoro-Acetabular Impingement** (22 minutes)
   Christopher L. Peters, MD and Jill A. Erickson, PhD

4. **Hip Resurfacing: Direct Anterior Approach** (12 minutes)
   William J. Hozack, MD; Michael M. Nogler, MD; Stefan Kreuzer, MD; and Martin Krismer, MD

5. **Imageless Navigation in Hip Resurfacing Arthroplasty** (15 minutes)
   Michael L. Swank, MD and Amy L. Hallock, MEd

6. **Basics of Computer Navigation in Total Knee Arthroplasty** (11 minutes)
   James B. Stiehl, MD

7. **Lateral Approach for Valgus Total Knee Arthroplasty** (12 minutes)
   James B. Stiehl, MD

8. **Molded Articulating Cement Spacers for Treatment of Infected Total Knee Arthroplasty** (12 minutes)
   Adolph V. Lombardi Jr., MD, FACS; Keith R. Berend, MD; and Joanne B. Adams, BFA

9. **Arthroscopic Suprascapular Nerve Release** (23 minutes)
   Laurent Lafosse, MD

10. **Open Repair of Acute and Chronic Distal Biceps Ruptures** (25 minutes)
    James Michael Bennett, MD; Thomas Lynn Mehlhoff, MD; and James Burlin Bennett, MD

11. **Arthroscopic Acetabular Labral Repair: Surgical Technique** (9 minutes)
    Marc J. Philippon, MD; Mike J. Huang, MD; Karen K. Briggs, MPH, MBA; and David A. Kuppersmith, BS

12. **Anterior Cruciate Ligament Reconstruction Using Achilles Allograft and Interference Screws** (10 minutes)
    Colin G. Looney, MD and William I. Sterett, MD

13. **Osteochondral Lesion of the Talus (OLT): Technique of Osteochondral Autologous Graft Transfer** (11 minutes)
    Sameh A. Labib, MD and Brett A. Sweitzer, MD

14. **Revision ACL Reconstruction Using the Anatomic Double Bundle Concept** (14 minutes)
    Freddie H. Fu, MD; Nicholas J. Honkamp, MD; Wei Shen, MD, PhD; Anil S. Ranawat, MD; and Fotios Tjoumikaris, MD

15. **The Krukenberg Procedure for Children** (25 minutes)
    Hugh Godfrey Watts, MD; John F. Lawrence, MD; and Joanna Patton, ROT

16. **Single Incision Direct Anterior Approach to Total Hip Arthroplasty** (13 minutes)
    William J. Hozack, MD; Michael M. Nogler, MD; Javad Parvizi, MD, FRCS; Eckart Mayr, MD; and Krismer Martin, MD

17. **Medial Patellofemoral Ligament Reconstruction** (13 minutes)
    Ryan E. Dobbs, MD; Patrick E. Greis, MD; and Robert T. Burks, MD

18. **Hip Arthroscopy: Operative Set-Up and Anatomically Guided Portal Placement** (8 minutes)
    Allston Julius Stubbs, MD; Karen K. Briggs, MPH, MBA; and Marc J. Philippon, MD

19. **Anatomy of the Shoulder** (24 minutes)
    Donald F. D'Alessandro, MD

20. **Anterolateral Approach in Minimally Invasive Total Hip Arthroplasty** (18 minutes)
    Leonard Remia, MD

21. **Patient Specific Knee Design: An Evolution in Computer-Assisted Surgery** (22 minutes)
    Adolph V. Lombardi Jr., MD, FACS; Keith R. Berend, MD; and Joanne B. Adams, BFA

22. **Hemiarthroplasty for a Comminuted Fracture of the Proximal Humerus** (20 minutes)
    Jon J.P. Warner, MD; Darren J. Friedman, MD; Zachary R. Zimmer, BA; and Laurence D. Higgins, MD

23. **Rotator Interval Repari of the Shoulder: Biomechanics and Technique** (7 minutes)
    LCDR Matthew T. Provencher, MD, MC, USN and Daniel J. Solomon, MD

24. **Excision of Calcaneonavicular Tarsal Coalition** (7 minutes)
    Maurice Albright, MD; Brian Grottkau, MD; and Gleeson Rebello, MD

25. **Extensile Surgical Approach for the Resection of Large Tumors of the Axilla and Brachial Plexus** (9 minutes)
    James C. Wittig, MD; Alex R. Vap, BA; Camilo E. Villalobos, MD; Brett L. Hayden, BA; Andrew M. Silverman, BA; and Martin M. Malawer, MD

26. **The Anterior Supine Intermuscular Approach in Primary Total Hip Arthroplasty** (18 minutes)
Keith R. Berend, MD; Adolph V. Lombardi Jr., MD; and Joanne B. Adams, BFA, CMI

27. **Robotic Arm-Assisted Unicompartmental Knee Arthroplasty: An Introductory Guide** (15 minutes)
Christopher John Dy, MD; Kristofer Jones, MD; Samuel Arthur Taylor, MD; Anil Ranawat, MD; and Andrew D. Pearle, MD

28. **Vertical Humeral Osteotomy for the Revision of Humeral Components in Shoulder Arthroplasty** (21 minutes)
Geoffrey Van Thiel, MD; Gregory P. Nicholson, MD; James Patrick Halloran, MD; Dana Piasecki, MD; Matthew T. Provencher, MD; and Anthony A. Romeo, MD

29. **Techniques for Safe Portal Placement in the Shoulder: The Ring of Fire** (13 minutes)
Keith D. Nord, MD; Bradford A. Wall, MD; Prithviraj Chavan, MD; and William H. Garrett, BS

30. **Reconstruction of the Medial Collateral Ligament of the Elbow** (12 minutes)
James Michael Bennett, MD; Thomas Lynn Melhoff, MD; and Rodney K. Baker

31. **Reconstruction of Abductor Mechanism-Gluteus Maximus Flap Transfer** (15 minutes)
Leo Whiteside, MD and Marcel Roy, PhD

32. **Kinematic Alignment with Modified Conventional Instruments Instead of Patient-Specific Guides** (26 minutes)
Stephen Howell, MD

33. **Arthroscopic Management of Femoroacetabular Impingement** (12 minutes)
J. W. Thomas Byrd, MD

34. **Arthroscopic Suprascapular Nerve Decompression: Etiology, Diagnosis, and Surgical Technique** (21 minutes)
Sanjeev Bhatia, MD; Adam B. Yanke, MD; Neil S. Ghodadra, MD; Seth Sherman, MD; Anthony A. Romeo, MD; and Nikhil N. Verma, MD

35. **Combined Cartilage Restoration and Distal Realignment for Patellar and Trochlear Chondral Lesions** (12 minutes)
Peter Chalmers, MD; Adam B. Yanke, MD; Seth Sherman, MD; Vasili Karas, BS; and Brian Cole, MD, MBA

36. **Simple Arthroscopic Anterior Capsulo-Labral Reconstruction of the Shoulder** (17 minutes)
Stephen J. Snyder, MD and Jeffrey D. Jackson, MD

37. **Proximal Humerus Resection for Parosteal Osteosarcoma** (16 minutes)
Yvette Ho, MD; Camilo E. Villalobos, MD; and James C. Wittig, MD

38. **Biceps Tenodesis: Open Subpectoral and Arthroscopic Technique** (19 minutes)
Adam B. Yanke, MD; Peter N. Chalmers, MD; Anthony A. Romeo, MD; and Nikhil N. Verma, MD

39. **Total Shoulder Arthroplasty: Steps to Get It Right** (15 minutes)
Richard J. Hawkins, MD

40. **ACL Anatomic Single Bundle Reconstruction Technical Note and Results** (20 minutes)
Michael W. Moser, MD; Gonzalo Samitier Solis, MD; Terese L. Chmieleski, PT, PhD; and Trevor Lentz, PT

41. **Surgical Repair of Proximal Hamstring Avulsion in the Athlete** (15 minutes)
Tal S. David, MD and Gabriel L. Petruccelli, MD

42. **Removal of a Broken Intramedullary Nail and Exchange Nailing for Tibial Nonunion** (10 minutes)
Kenneth A. Egol, MD; Abiola Atanda, MD; Mathew Hamula, BA, BS; and Jason P. Hochfelder, MD

43. **Radical Resection of the Glenoid and Scapular Neck for Sarcoma and Reconstruction** (11 minutes)
Brendon J. Comer, BA; Brett L. Hayden, BA; Camilo E. Villalobos, MD; and James C. Wittig, MD

44. **Shoulder Arthrodesis: Surgical Technique** (11 minutes)
Ryan Warth, MD and Peter J. Millett, MD, MSc

45. **Approaches to the Hip: Minimally Invasive Posterolateral Total Hip Arthroplasty** (24 minutes)
Cesare Faldini, MD; Francesco Traina, MD; Mohammadreza Chehrassan, MD; Raffaele Borghi, MD; Daniele Fabbri, MD; Matteo Nanni, MD; Federico Pilla, MD; Marco Pedrini, MD; and Sandro Giannini, MD

46. **Modified Anterolateral Approach with Femoral Anterior Cortical Window for Revision Total Hip Arthroplasty** (15 minutes)
Amgad M. Haleem, MD, MSc; Morteza Meftah, MD; Brian Domingues, BA; and Stephen J. Incavo, MD

47. **Spine Scapular Non-Union ORIF Solution** (8 minutes)
Thomas W. Wright, MD and Gonzalo Samitier Solis, MD, PhD

48. **Fixation of Odontoid Fractures with an Anterior Screw: Surgical Technique** (14 minutes)
Manuel Valencia, MD; Paulina De La Fuente, MD; Selim Abara, MD; Felipe Novoa, MD, Andres Leiva, MD; and Arturo Olid, MD

49. **Partial Two-Stage Exchange for Infected Total Hip Arthroplasty** (16 minutes)
Adolph V. Lombardi Jr., MD, FACS; Timothy Ekpo, DO; Keith R. Berend, MD; Michael J. Morris, MD; and Joanne B. Adams, BFA, CMI

50. **Medial Mobile-Bearing UKA with Twin-Peg Femoral Design and Enhanced Instrumentation** (18 minutes)
Keith R. Berend, MD; Adolph V. Lombardi Jr., MD, FACS; Jason M. Hurst, MD; Michael J. Morris, MD; Joanne B. Adams, BFA, CMI; Keri L. Satterwhite; and Michael A. Sneller, BS

51. **Surgical Treatment of Spondylolisthesis by Posterolateral Arthrodesis and Instrumentation** (9 minutes)
    Antonello Montanaro, MD; Francesco Turturro, MD; Cosma Calderaro, MD; Luca Labianca, MD; Vicenzo Di Sanzo, MD, PhD; Pierpaola Rota, MD; Alessandro Carducci, MD; and Andrea Ferretti, MD

52. **Transosseous Equivalent Pectoralis Major Tendon Repair** (8 minutes)
    Kevin W. Farmer, MD and Gonzalo Samitier Solis, MD, PhD

53. **Posterolateral Corner Primary Repair And Reconstruction Case Based** (18 minutes)
    Mark D. Miller, MD; Sean Higgins; and Brian C. Werner, MD

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Dana Piasecki, MD *(n.)*
Federico Pilla, MD *(n.)*

Matthew T. Provencher, MD *(8. Arthroscopy, BMC Musculoskeletal Disorders, Knee, Orthopedics, SLACK Inc., Vindico Orthopaedic Hyperguide; 9. AAOS, AOSSM, American Shoulder and Elbow Surgeons, AANA, International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine, San Diego Shoulder Institute, SOMOS)*
Anil Ranawat, MD *(4. MAKO, ConforMIS)*
Gleeson Rebello, MD *(n.)*
Leonard Remia, MD *(3b. Encore Medical; 6. Encore Medical)*
Anthony A. Romeo, MD *(1. Arthrex, Inc.; 2. Arthrex, Inc.; 3b. Arthrex, Inc.; 5. Arthrex, Inc., DJO Surgical, Smith & Nephew, Ossur; 6. Arthrex, Inc., DJ Surgical; 7. Saunders/Mosby-Elsevier; 8. Journal of Shoulder and Elbow Surgery, SLACK Inc., Orthopedics Today, Orthopedics, Sports Health, Techniques in Shoulder and Elbow Surgery, Operative Techniques in Sports Medicine, Orthopaedic Journal of Sports Medicine ; 9. American Orthopaedic Society for Sports Medicine, American Shoulder and Elbow Surgeon, Arthroscopy Association of North America)*
Pierpaola Rota, MD *(n.)*
Marcel Roy, PhD *(3c. Signal Medical Corp.)*
Keri L. Satterwhite *(n.)*
Wei Shen, MD, PhD *(n.)*
Seth Sherman, MD *(n.)*
Andrew M. Silverman, BA *(n.)*
Michael A. Sneller, BS *(n.)*
Stephen J. Snyder, MD *(1. Arthrex, Inc., DJ Orthopaedics, Linvatec, Sawbones/Pacific Research Laboratories, Wright Medical Technology, Inc.; 3a. Redyns Medical; 3b. Synthes; 4. Redyns Medical, Johnson & Johnson, Wright Medical; 7. Wolters Kluwer Health - Lippincott Williams & Wilkins)*
Gonzalo Samitier Solis, MD, PhD *(8. International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine; 9. International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine)*
Daniel J. Solomon, MD *(2. Arthrex, Inc., Pacific Medical; 8. Arthroscopy, American Orthopedic Sports Medicine Society Sports Medicine Update ; 9. AAOS, American Orthopaedic Society for Sports Medicine, SOMOS)*
William I. Sterett, MD *(1. Biomet; 3b. Arthrex, Inc.; 5. Arthrex, Inc., Smith & Nephew, Ossur, Siemens)*
James B. Stiehl, MD *(1. Zimmer, Innomed; 2. Blue Orthopaedics Computer Company, Zimmer; 3b. Blue Orthopaedics Computer Company, Zimmer 3c. Exactech, Inc.; 4. Blue Orthopaedics Computer Company, Traumis, Inc. Technology Company; 8. Knee, Journal of Arthroplasty)*
Allston J. Stubbs, MD *(3b. Smith & Nephew; 4. Johnson & Johnson, Inc.; 5. Bauerfeind, AG; 8. VuMedi.com, Journal of Arthroscopy; 9. International Society for Hip Arthroscopy, American Orthopaedic Society for Sports Medicine, Arthroscopy Association of North America)*
Michael L. Swank, MD *(3b. Brainlab, DePuy; 6. Brainlab, DePuy)*
Brett A. Sweitzer, MD *(n.)*
Samuel Arthur Taylor, MD *(n.)*
Fotios P. Tjoumakaris, MD *(2. Ferring Pharmaceutical)*
Francesco Traina, MD *(n.)*
Francesco Turturro, MD *(n.)*
Manuel Valencia, MD *(n.)*
Geoffrey S. Van Thiel, MD *(n.)*

Alex R. Vap, BA *(n.)*
Nikhil N. Verma, MD *(1. Smith & Nephew; 2. Arthrosurface; 3b. Smith & Nephew, Arthrex, Inc.; 4. Omeros; 5. Arthrex, Inc., Smith & Nephew, Athletico, ConMed Linvatec, Miomed, Mitek, Arthrosurface; 7. Vindico Medical-Orthopedics Hyperguide, Arthroscopy; 8. Journal of Knee Surgery: Arthroscopy: SLACK Inc.; 9. Arthroscopy Association Learning Center Committee)*
Camilo E. Villalobos, MD *(n.)*
Bradford A. Wall, MD *(n.)*
Jon J.P. Warner, MD *(1. Zimmer, Tornier; 6. Arthrocare, DJ Orthopaedics, Arthrex, Inc., Mitek, Breg, Smith & Nephew)*
Ryan Warth, MD *(n.)*

Hugh Godfrey Watts, MD *(n.)*
Brian C. Werner, MD *(n.)*
Leo Whiteside, MD *(1. Smith & Nephew, Stryker; 2. Smith & Nephew; 3b. Signal Medical Corp.; 3c. Smith & Nephew; 4. Signal Medical Corp.; 8. Journal of Arthroplasty, Clinical Orthopaedics and Related Research, Journal of Orthopaedics and Traumatology)*
James C. Wittig, MD *(n.)*
Thomas W. Wright, MD *(1. Exactech, Inc.; 5. Exactech, Inc.; 7. Wolters Kluwer Health - Lippincott Williams & Wilkins; 8. Journal of Hand Surgery – American)*
Adam B. Yanke, MD *(n.)*
Zachary R. Zimmer, BA *(n.)*

Western Orthopaedic Association

78th Annual Meeting

July 31 – August 2, 2014

The Fairmont Orchid
Big Island, Hawaii

2014 CME Credit Record

Multimedia Education

Instructions: To ensure correct CME credit is awarded, please complete this form, indicating the DVDs you watched. Return this form to the WOA Registration Desk or complete the Credit Record online at www.woa-assn.org. You may also mail this form to Western Orthopaedic Association, 110 West Road, Suite 227, Towson, MD 21204. CME certificates will be awarded to all participants. Unless you have provided a legible email address, please allow up to 30 days to receive your CME certificate.

Please Print:

Name: _____

Address: _____

City: _____ *State:* _____ *Zip:* _____

Phone: _____ *Fax:* _____

Email Address: _____

Thank you for your cooperation.

2014 CME Credit Record Multimedia Education

Please place an × in the box by each DVD viewed and write any comments you may have in the space provided. You will be awarded hour per hour credit for time of participation.

☐ DVD 1 (25 min)	☐ DVD 12 (10 min)	☐ DVD 23 (7 min)	☐ DVD 34 (21 min)	☐ DVD 45 (24 min)
☐ DVD 2 (11 min)	☐ DVD 13 (11 min)	☐ DVD 24 (7 min)	☐ DVD 35 (12 min)	☐ DVD 46 (15 min)
☐ DVD 3 (22 min)	☐ DVD 14 (14 min)	☐ DVD 25 (9 min)	☐ DVD 36 (17 min)	☐ DVD 47 (8 min)
☐ DVD 4 (12 min)	☐ DVD 15 (25 min)	☐ DVD 26 (18 min)	☐ DVD 37 (16 min)	☐ DVD 48 (14 min)
☐ DVD 5 (15 min)	☐ DVD 16 (13 min)	☐ DVD 27 (15 min)	☐ DVD 38 (19 min)	☐ DVD 49 (16 min)
☐ DVD 6 (11 min)	☐ DVD 17 (13 min)	☐ DVD 28 (21 min)	☐ DVD 39 (15 min)	☐ DVD 50 (18 min)
☐ DVD 7 (12 min)	☐ DVD 18 (8 min)	☐ DVD 29 (13 min)	☐ DVD 40 (20 min)	☐ DVD 51 (9 min)
☐ DVD 8 (12 min)	☐ DVD 19 (24 min)	☐ DVD 30 (12 min)	☐ DVD 41 (15 min)	☐ DVD 52 (8 min)
☐ DVD 9 (23 min)	☐ DVD 20 (18 min)	☐ DVD 31 (15 min)	☐ DVD 42 (10 min)	☐ DVD 53 (18 min)
☐ DVD 10 (25 min)	☐ DVD 21 (22 min)	☐ DVD 32 (26 min)	☐ DVD 43 (11 min)	
☐ DVD 11 (9 min)	☐ DVD 22 (20 min)	☐ DVD 33 (12 min)	☐ DVD 44 (11 min)	

Please indicate the DVD(s) you found to be most meaningful and any comments. Begin with the DVD number.

Please indicate any feedback that you may have concerning other DVDs. Begin with the DVD number.

Please indicate any comments or suggestions that you have regarding the Multimedia Presentations.

Western Orthopaedic Association

78th Annual Meeting

July 31 – August 2, 2014

The Fairmont Orchid
Big Island, Hawaii

2014 CME Credit Record

Scientific Program

Instructions: To ensure correct CME credit is awarded, please complete this form, indicating the Sessions you attended. Return this form to the WOA Registration Desk or complete the Credit Record online at www.woa-assn.org. You may also mail this form to Western Orthopaedic Association, 110 West Road, Suite 227, Towson, MD 21204. CME certificates will be awarded to all participants. Unless you have provided a legible email address, please allow up to 30 days to receive your CME certificate.

Please Print:

Name: _____

Address: _____

City: _____ *State:* _____ *Zip:* _____

Phone: _____ *Fax:* _____

Email Address: _____

Thank you for your cooperation.

2014 CME Credit Record Scientific Program

Please rate by circling the appropriate number.

5 = Excellent 4 = Good 3 = Satisfactory 2 = Fair 1 = Poor

Thursday, July 31, 2014

Sessions	Check if Attended	Presented objective balanced, & scientifically rigorous content	Achieved stated objectives	Satisfied my educational and/or professional needs
General Session 1	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium 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*
General Session 2	☐	*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*
Concurrent Session 3	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
or				
Concurrent Session 4	☐			
or				
PA Session 1	☐			

Friday, August 1, 2014

Sessions	Check if Attended	Presented objective balanced, & scientifically rigorous content	Achieved stated objectives	Satisfied my educational and/or professional needs
General Session 5	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Concurrent Session 6	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
or				
Concurrent Session 7	☐			
or				
PA Session 2	☐			
Symposium 4	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 8	☐	*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*
Concurrent Session 9	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
or				
Concurrent Session 10	☐			
or				
PA Session 3	☐			

Saturday, August 2, 2014

Sessions	Check if Attended	Presented objective balanced, & scientifically rigorous content	Achieved stated objectives	Satisfied my educational and/or professional needs
Symposium 6	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 11	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium 7	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 12	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 13	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 14	☐	*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*
Concurrent Session 15	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
or				
Concurrent Session 16	☐			
or				
PA Session 4	☐			

Comments: _____

_____

Western Orthopaedic Association

78th Annual Meeting

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Big Island, Hawaii

2014 CME Credit Record

Poster Presentations

Instructions: To ensure correct CME credit is awarded, please complete this form, indicating the posters viewed. Return this form to the WOA Registration Desk or complete the Credit Record online at www.woa-assn.org. You may also mail this form to Western Orthopaedic Association, 110 West Road, Suite 227, Towson, MD 21204. CME certificates will be awarded to all participants. Unless you have provided a legible email address, please allow up to 30 days to receive your CME certificate.

Please Print:

Name: _____

Address: _____

City: _____ *State:* _____ *Zip:* _____

Phone: _____ *Fax:* _____

Email Address: _____

Thank you for your cooperation.

2014 CME Credit Record
Poster Presentations

Please place an X in the box by each posters viewed and write any comments you may have in the space provided. Each poster viewed will account for 15 minutes of CME credit. There is a maximum of 7 CME credits available during the course of the meeting for viewing posters (or a total of 28 posters).

☐ 1	☐ 7	☐ 13	☐ 19	☐ 25	☐ 31
☐ 2	☐ 8	☐ 14	☐ 20	☐ 26	☐ 32
☐ 3	☐ 9	☐ 15	☐ 21	☐ 27	☐ 33
☐ 4	☐ 10	☐ 16	☐ 22	☐ 28	☐ 34
☐ 5	☐ 11	☐ 17	☐ 23	☐ 29	☐ 35
☐ 6	☐ 12	☐ 18	☐ 24	☐ 30	☐ 36

Please indicate the poster(s) you found to be most meaningful and any comments. Begin with the poster number.

_____

_____

_____

_____

Please indicate any feedback that you may have concerning other posters. Begin with the poster number.

_____

_____

_____

_____

Please indicate any comments or suggestions that you have regarding the Poster Presentations.

_____

_____

_____

_____

2014 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: _____

_____

_____

2015 Needs Assessment Survey

Please list any medical topics that you would like included in future programs planned by WOA.

_____

_____

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_____

Please list any Office Management Topics that you would like included in the program.
Management of:

_____

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_____

See you next year!

July 29 - August 1, 2015
The Coeur d'Alene
Coeur d'Alene, Idaho

Exhibitor & Grantor Acknowledgements

The Western Orthopaedic Association is grateful for the support of its exhibitors and educational grantors. Thank you for your participation and commitment to WOA.

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Corentec America, Inc.
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