Western Orthopaedic Association

79th Annual Meeting

July 29–August 1, 2015
The Coeur d'Alene Hotel
Coeur d'Alene, Idaho

2015
Meeting Program

Chuck Freitag

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

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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 accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership 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 29.25 ***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

Paul C.Collins, MD

Dear Colleagues,

Welcome to Idaho! I hope to personally say this to you at the 79th Annual Meeting of the Western Orthopaedic Association meeting in Coeur d'Alene, Idaho!! From July 29th through August 1st at the Coeur d'Alene resort you will first and foremost get a tremendous educational experience.

The Program Committee under the leadership of Payam Tabrizi has created a strong set of presentations totaling 29.25 CME credits. There will be 7 Symposia with national and international faculty covering a wide range of orthopaedic topics. Speakers include:

- Dr. Milton "Chip" Routt – Sacral Fractures
- Dr. Susan Bukata – Metabolic Bone Disease
- Dr. William Maloney – Complex Arthroplasty of the Hip and Knee
- Dr. Mike Coughlin – Complex Treatment of the Adult Foot

Further, we will have Rapid Fire paper presentation sessions where attendees can discuss their topics of interest – under rapid fire indeed! Daily poster tours will include moderators to direct the discussion to your interests. For your "Hands-On" options we will have Saw Bones Skills labs as well. Nothing better than the sound of saws! To maximize your time we will have a luncheon discussion of *Opioid Use – A Tidal Wave.* PA's will be included to share in these educational opportunities, so we hope you brought your PA along.

As a leader in Maintenance of Certification (MOC), the Western Orthopaedic Association will have a Self-Assessment Exam you can participate in at your schedule and keep ahead of the "MOC" wave – at no cost to Western Orthopaedic Association members!

For future planning, we are going to have Dr. David Teuscher, AAOS President, bring us up to date in the progress of the AAOS. The rate of change has been accelerating at an incredible speed. Dr. Douglas Jackson is going to give the long-term presidential speech on what he sees as the future of our specialty. This will be augmented by a discussion by Dr. Kevin Leman, PhD about how we might personally deal with all these changes ahead. This will be a great combination for us as well as our friends and families.

Now, for you and your family, Stacy Wald and the WOA staff have created a fantastic set of options for you to enjoy everything from Boating to Kayaking to Golf to Tennis to "Idaho" shopping to Craft Creation to the Silverwood Theme Park to having you and your partners seeing what Idaho has to offer! Arts and Craft programs for the kids are already set up and you/they will come home with lots of treasures.

I and the Western Orthopaedic Association staff hope to see you in Coeur d'Alene. We have had a tremendous amount of fun setting this meeting up, and know you will create your own family treasures as you increase your educational experience. A great combination! I look forward to personally welcoming you to Coeur d'Alene!

Sincerely,

Paul Collins

Paul C. Collins, MD

WOA President

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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.

WEDNESDAY, JULY 29, 2015

12:00pm – 5:00pm	**Board of Directors Meeting** *(Casco Bay Room)*
12:00pm – 5:00pm	**Meeting Registration** *(Registration Area)*
12:00pm – 5:00pm	**Exhibit Setup** *(Bay Rooms 2-3)*
12:00pm – 5 00pm	**Scientific Poster Setup** *(Bay Room 1)*
12:00pm – 5:00pm	**Speaker Ready Room** *(North Cape Bay Room)*
5:00pm – 7:00pm	**WOA Workshop / Skills Lab – Distal Femur Fractures (Plate versus IMN)** *(Kidd Island Bay Room)*

THURSDAY, JULY 30, 2015

5:50am – 6:50am	**Scientific Poster Session** *(Bay Room 1)* Note: Presenters will be available to answer questions.
5:50am – 1:40pm	**Speaker Ready Room** *(North Cape Bay Room)*
6:30am – 1:40pm	**Meeting Registration** *(Registration Area)*
6:45am – 1:40pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks and Daily Drawing** *(Bay Rooms 2-3)*
6:50am – 7:05am	**First Business Meeting** *(Bay Rooms 4-5)*
7:05am – 1:40pm	**Scientific Sessions and Symposia** *(Bay Rooms 4-5)*
8:00am – 8:20am	**Break — Please visit Exhibits** *(Bay Rooms 2-3)*
8:15am – 9:45am	**Spouse/Children's Hospitality** *(Lakeview Terrace)*
8:45am – 9:45am	**Concurrent PA Session 1** *(Bay Room 6)*
9:05am – 9:45am	**Rapid Fire Sessions 3A-D** *(Foyer)*
9:45am – 10:05am	**Break — Please visit Exhibits** *(Bay Rooms 2-3)*
10:05am – 10:55am	**Howard Steel Lecturer** *(Bay Rooms 4-5)*
11:00am – 1:00pm	**Fusion Glass Jewelry/Ornament Making** *(Meet in Lobby)*
11:45am – 12:45pm	**WOA Luncheon — Industry Presentation by Mallinckrodt Pharmaceuticals** *(Bay Rooms 4-5)* *CME Credit Not Available
1:10pm – 3:15pm	**Historic Lake Cruise** *(Meet in Lobby)*

* See Activities Information on pages 10-12 for more details

1:15pm – 5:15pm	**Kayak/Hiking Tour** *(Meet in Lobby)*
1:40pm – 4:00pm	**Multimedia Education Session** *(North Cape Bay Room)*
4:00pm – 5:00pm	**Scientific Poster Tours — Upper Extremity** *(Bay Room 1)* Note: Presenters will be available to answer questions.
5:30pm – 6:30pm	**New Member/PA Reception** *(Hagadone Suite 1801)*
6:30pm – 9:30pm	**Welcome Reception** *(Meet at Boat Dock at 6:15pm for 20 minute boat ride to the Hagadone Event Center)*

FRIDAY, JULY 31, 2015

6:00am – 7:00am	**Regional and AAOS President's Breakfast Meeting with State Presidents and Board of Councilors** *(Casco Bay Room)*
6:00am – 7:00am	**Scientific Poster Session** *(Bay Room 1)* Note: Presenters will be available to answer questions.
6:00am – 1:40pm	**Speaker Ready Room** *(North Cape Bay Room)*
6:30am – 1:40pm	**Meeting Registration** *(Registration Area)*
6:45am – 1:40pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks and Daily Drawing** *(Bay Rooms 2-3)*
7:00am – 1:40pm	**Scientific Sessions and Symposia** *(Bay Rooms 4-5)*
7:00am – 7:50am	**Concurrent PA Session 2** *(Bay Room 6)*
7:50am – 8:10am	**Break — Please visit Exhibits** *(Bay Rooms 2-3)*
8:40am – 9:35am	**Concurrent PA Session 3** *(Bay Room 6)*
8:55am – 9:35am	**Rapid Fire Sessions 7A-D** *(Foyer)*
9:35am – 9:55am	**Break — Please visit Exhibits** *(Bay Rooms 2-3)*
10:00am – 12:00pm	**Fusion Glass Jewelry/Ornament Making** *(Meet in Lobby)*
10:15am – 10:25am	**Presidential Address** *(Bay Rooms 4-5)*
11:55am – 12:35pm	**WOA Luncheon — Industry Presentation by DT MedSurg, LLC** *(Bay Rooms 4-5)* *CME Credit Not Available
12:30pm – 5:00pm	**Golf Tournament** *(Meet in Lobby at 12:15pm)*
1:30pm – 3:30pm	**Tennis Round Robin** *(Meet in Lobby at 1:15pm)*
1:40pm – 4:00pm	**Multimedia Education Session** *(North Cape Bay Room)*
4:00pm – 5:00pm	**Scientific Poster Tours — Lower Extremity** *(Bay Room 1)* Note: Presenters will be available to answer questions.
5:30pm – 7:30pm	**Exhibitor Reception** *(Bay Rooms 2-3)*
5:30pm – 7:30pm	**Kid's Movie Night with Arts & Crafts and Dinner** *(Bay Room 6)*

* See Activities Information on pages 10-12 for more details

SATURDAY, AUGUST 1, 2015

5:50am – 6:50am	**Scientific Poster Session** *(Bay Room 1)* Note: Presenters will be available to answer questions.
6:00am – 6:50am	**WOA Board Meeting w/Breakfast** *(Casco Bay Room)*
6:00am – 2:20pm	**Speaker Ready Room** *(North Cape Bay Room)*
6:30am – 2:20pm	**Meeting Registration** *(Registration Area)*
6:45am – 2:20pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks and Daily Drawing** *(Bay Rooms 2-3)*
6:50am – 7:00am	**Second Business Meeting** *(Bay Rooms 4-5)*
7:00am – 2:25pm	**Scientific Sessions and Symposia** *(Bay Rooms 4-5)*
7:30am – 8:25am	**Concurrent PA Session 4** *(Bay Room 6)*
8:55am – 9:20am	**Break — Please visit Exhibits** *(Bay Rooms 2-3)*
11:00am – 11:30am	**Presidential Guest Speaker** *(Bay Rooms 4-5)*
11:30am – 11:40am	**Refreshment Break** *(Foyer)*
12:30pm – 5:30pm	**Silverwood Theme Park** *(Meet in Lobby)*
12:55pm – 1:25pm	**Rapid Fire Sessions 13A-D** *(Foyer)*
1:30pm – 5:30pm	**Fly Fishing** *(Meet in Lobby)*
2:25pm – 2:55pm	**Show & Tell 30 — Industry Presentation by THINK Surgical** *(Foyer)* Active Robotics for Total Joint Replacement Wine, beer, and soda provided. *CME Credit Not Available
2:55pm – 3:25pm	**Scientific Poster Session** *(Bay Room 1)* Note: Presenters will be available to answer questions.
3:25pm – 4:25pm	**Multimedia Education Session** *(North Cape Bay Room)*
3:00pm – 4:30pm	**Masterclass of North West Wines with Sommelier** *(Meet in Lobby)*
6:15pm – 7:00pm	**Family Gala Reception** *(Lakeview Terrace)*
7:00pm –11:00pm	**Family Gala Dinner Dance** *(Bay Rooms 4 & 5)*

* See Activities Information on pages 10-12 for more details

Scientific Program Agenda

Bay Rooms 4-5 (unless otherwise specified)

Presenters and times are subject to change.

WEDNESDAY, JULY 29, 2015

12:00pm – 5 00pm	**Scientific Poster Setup** *(Bay Room 1)*
12:00pm – 5:00pm	**Speaker Ready Room** *(North Cape Bay Room)*
5:00pm – 7:00pm	**WOA Workshop / Skills Lab — Distal Femur Fractures (Plate versus IMN)** *(Kidd Island Bay Room)*

THURSDAY, JULY 30, 2015

5:50am – 6:50am	**Scientific Poster Session** *(Bay Room 1)* Note: Presenters will be available to answer questions.
5:50am – 1:40pm	**Speaker Ready Room** *(North Cape Bay Room)*
6:50am – 7:05am	**First Business Meeting**
7:05am – 7:10am	**Welcome**
7:10am – 8:00am	**General Session 1 — Upper Extremity Trauma Debates (ARS)**
8:00am – 8:20am	**Break — Please visit Exhibits** *(Bay Rooms 2-3)*
8:20am – 9:00am	**General Session 2 — Orthopaedic Practice Patterns & National Trends: Part 1**
8:45am – 9:45am	**Concurrent PA Session 1** *(Bay Room 6)*
9:00am – 9:05am	**Go to Rapid Fire Stations**
9:05am – 9:45am	**Rapid Fire Session 3A: Basic Science** *(Foyer)* **Rapid Fire Session 3B: Hip** *(Foyer)* **Rapid Fire Session 3C: Pediatrics** *(Foyer)* **Rapid Fire Session 3D: Sports (Knee)** *(Foyer)*
9:45am – 10:05am	**Break — Please visit Exhibits** *(Bay Room 2-3)*
10:05am – 10:55am	**General Session 4 — Howard Steel Lecturer**
10:55am – 11:45am	**Symposium 1 — Basic Science** *"She Blinded Me with Science" – Thomas Dobly (1982)*
11:45am – 12:45pm	**WOA Luncheon — Industry Presentation by Mallinckrodt Pharmaceuticals** *CME Credit Not Available
12:45pm – 1:40pm	**Symposium 2 — Foot & Ankle** *"Footloose" – Kenny Loggins (1984)*
1:40pm – 4:00pm	**Multimedia Education Session** *(North Cape Bay Room)*

4:00pm – 5:00pm	**Scientific Poster Tours — Upper Extremity** *(Bay Room 1)* Note: Presenters will be available to answer questions.

FRIDAY, JULY 31, 2015

6:00am – 7:00am	**Scientific Poster Session** *(Bay Room 1)* Note: Presenters will be available to answer questions.
6:00am – 1:40pm	**Speaker Ready Room** *(North Cape Bay Room)*
7:00am – 7:50am	**General Session 5 — Lower Extremity Trauma Debates (ARS)**
7:00am – 7:50am	**Concurrent PA Session 2** *(Bay Room 6)*
7:50am – 8:10am	**Break — Please visit Exhibits** *(Bay Rooms 2-3)*
8:10am – 8:50am	**General Session 6 — Orthopaedic Practice Patterns & National Trends: Part 2**
8:40am – 9:35am	**Concurrent PA Session 3** *(Bay Room 6)*
8:50am – 8:55am	**Go to Rapid Fire Stations**
8:55am – 9:35am	**Rapid Fire Session7A: Academics** *(Foyer)* **Rapid Fire Session 7B: Foot & Ankle** *(Foyer)* **Rapid Fire Session 7C: Spine** *(Foyer)* **Rapid Fire Session 7D: Shoulder** *(Foyer)*
9:35am – 9:55am	**Break — Please visit Exhibits** *(Bay Rooms 2-3)*
9:55am – 10:55am	**General Session 8 — Presidential Address and OREF Update**
10:55am – 11:55am	**Symposium 3 — Hip Arthritis** *"Hip to be Square" – Huey Lewis & the News (1986)*
11:55am – 12:35pm	**WOA Luncheon — Industry Presentation by DT MedSurg, LLC** *CME Credit Not Available
12:35pm – 1:40pm	**Symposium 4 — Complex Periarticular Fractures of the Lower Extremity** *"Shattered" – Rolling Stones (1982)*
1:40pm – 4:00pm	**Multimedia Education Session** *(North Cape Bay Room)*
4:00pm – 5:00pm	**Scientific Poster Tours — Lower Extremity** *(Bay Room 1)* Note: Presenters will be available to answer questions.

SATURDAY, AUGUST 1, 2015

5:50am – 6:50am	**Scientific Poster Session** *(Bay Room 1)* Note: Presenters will be available to answer questions.
6:00am – 2:20pm	**Speaker Ready Room** *(North Cape Bay Room)*
6:50am – 7:00am	**Second Business Meeting**
7:00am – 7:35am	**General Session 9 — WOA/OREF Young Investigator Awards** *"Smooth Operator" – Sade (1984)*

7:35am – 8:25am	**General Session 10 — WOA Resident Awards** *"Like a Surgeon" – Weird Al Yankovich (1985)*
7:30am – 8:25am	**Concurrent PA Session 4** *(Bay Room 6)*
8:25am – 8:55am	**General Session 11 — Nights And Weekends: What To Expect On Pediatric Orthopaedic Call At Trauma Centers / How To Stay Out Of Trouble**
8:55am – 9:20am	**Break — Please visit Exhibits** *(Bay Room 2-3)*
9:20am – 10:40am	**Symposium 5 — Practice Management Symposium** *"Bad to the Bone" – George Thorogood (1982)*
10:40am – 11:30am	**General Session 12 — AAOS, BOC and Presidential Guest Speaker**
11:30am – 11:40am	**Refreshment Break** *(Foyer)*
11:40am – 12:50pm	**Symposium 6 — Sports Medicine / Upper Extremity** *"Hurts So Good" – John Cougar Mellencamp (1982)*
12:50pm – 12:55pm	**Go to Rapid Fire Stations**
12:55pm – 1:25pm	**Rapid Fire Session 13A: Orthopaedic Imaging** *(Foyer)* **Rapid Fire Session 13B: Hand, Wrist & Elbow** *(Foyer)* **Rapid Fire Session 13C: Knee** *(Foyer)* **Rapid Fire Session 13D: Trauma** *(Foyer)*
1:30pm – 2:20pm	**Symposium 7 — Spine Symposium** *"Let Your Backbone Slide" – Maestro Fresh Wes (1989)*
2:25pm – 2:55pm	**Show & Tell 30 — Industry Presentation by THINK Surgical** *(Foyer)* Active Robotics in Total Joint Replacement *CME Credit Not Available
2:55pm – 3:25pm	**Scientific Poster Session** *(Bay Room 1)* Note: Presenters will be available to answer questions.
3:25pm – 4:25pm	**Multimedia Education Session** *(North Cape Bay Room)*

Download the WOA Program to your phone or mobile device by going to your device's app store and searching "DTMS".

On a laptop or Windows phone, go to: datatrace.gatherdigital.com

Activities Information

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

THURSDAY, JULY 30, 2015

Spouse/Children's Hospitality

8:15am – 9:45am *(Lakeview Terrace)*

Join your friends and meet new spouses while enjoying a continental breakfast. Listen to the Howard Steel Speaker, Kevin Leman, PhD, internationally-known psychologist, business consultant and award winning author. Arts & Crafts will be provided for the children.

Price: *Included in Registration Fee or $40 per Unregistered Adult Guest; $20 per Unregistered Child (5-17 years)*

Fusion Glass Jewelry/Ornament Making

11:00am – 1:00pm *(Meet in Lobby)*

Create a one of a kind ornament and sun catcher. You will cut colorful pieces of glass using mosaic cutters and then arrange a design on a blank piece of glass that will be fused in a kiln. Artists will instruct participants in crafting the designs that you choose.

Price: *$50 per person (minimum age 6 years)*

WOA Luncheon — Industry Presentation by Mallinckrodt Pharmaceuticals

11:45am – 12:45pm *(Bay Rooms 4-5)*

*CME Credit Not Available

Price: *Included in Registration Fee*

Historic Lake Cruise

1:10pm – 3:15pm *(Meet in Lobby)*

This scenic boat cruise is a fascinating mix of local history and wildlife watching. Our Captains are experts on the lake, and will guide you through the history of our town, the steamships that once cruised our lake, and point out current areas of interest. Lake Coeur d'Alene was once described by National Geographic as one of the five most beautiful lakes in the world, and there is no better way to enjoy our beautiful city than by touring it.

Price: *$80 per Adult (over 12), $40 per Child (6-12) (minimum 20 people)*

Kayak/Hiking Tour

1:15pm – 5:15pm *(Meet in Lobby)*

Lake Coeur d'Alene is a paddler's paradise. Fed by the wild and scenic St. Joe River, Coeur d'Alene River, and St. Maries River, the lake is roughly 25 miles long, and with many bays, boasts over 125 miles of shoreline. This kayak tour will take you over crystal clear waters along shores of pine, fir, and cedar. You will also visit a few of the bays: some close to town, others a bit farther away. You will also learn about the Native peoples of the area, early pioneer history, the steamboat era, and Lake Coeur d'Alene today. You may also see osprey, great blue heron, bald eagles, and songbirds as your guide talks about the natural wonders in and around the lake.

Price: *$69 per Adult (18 & over), $62 per Child (minimum age 4-17) (Maximum 16 people) Children under 10 years must be in double Kayak with adult*

New Member/PA Reception

5:30pm – 6:30pm *(Hagadone Suite 1801)*

All WOA new members are invited to attend.

Price: *Included in Registration Fee*

Welcome Reception

6:30pm – 9:30pm *(Meet at Boat Dock at 6:15pm for 20 minute boat ride to the Hagadone Event Center.)*

Cruise on the Mish-an-Nock and Osprey to the Event Center overlooking beautiful lake Coeur d'Alene and savor delicious food delicacies and open bar while chatting with friends and colleagues.

Attire: Resort Casual (no coat required)

Price: *Included in Registration Fee or $100 per Unregistered Adult Guest; $50 per Unregistered Child (5-17 years)*

FRIDAY, JULY 31, 2015

Fusion Glass Jewelry/Ornament Making

10:00am – 12:00pm *(Meet in Lobby)*

Create a one of a kind ornament and sun catcher. You will cut colorful pieces of glass using mosaic cutters and then arrange a design on a blank piece of glass that will be fused in a kiln. Artists will instruct participants in crafting the designs that you choose.

Price: *$50 per person (minimum age 6 years)*

WOA Luncheon — Industry Presentation by DT MedSurg, LLC

11:55am – 12:35pm *(Bay Room 4-5)*

Advances in Post-operative Pain Management

Presented by: Robert Slater, MD and Nitin Bhatia, MD

(Seminar presentation supported by an unrestricted educational grant from Pacira Pharmaceuticals, Inc.)

*CME Credit Not Available

Price: *Included in Registration Fee*

Golf Tournament

12:30pm – 5:00pm *(Meet in Lobby at 12:15pm)*

Designer Scott Miller's vision was to create a golf course that offered a stimulating round of golf, immersing players in a pristine park-like environment. The result is fairways that play from tee to green on a lush carpet of Bent Grass, accented with beds of brilliant red Geraniums, acres of Junipers and the mountain water challenges of Lake Coeur d'Alene and Fernan Creek. The 6,803 yard par 71 course boasts a view of the lake from every hole and of course, you can't miss the Famous Floating Green on the 14th hole. The tournament will be a shotgun start with a scramble format.

Price: *$245 per person (Includes transportation, greens fee, lunch and beverage cart)*

Tennis Round Robin

1:30pm – 3:30pm *(Meet in Lobby at 1:15pm)*

Price: *$20 per person (minimum 4 people)*

Exhibitor Reception

5:30pm – 7:30pm *(Bay Rooms 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 *(Bay Room 6)*

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 1, 2015

Silverwood Theme Park

12:30pm – 5:30pm *(Meet in Lobby)*

Located in beautiful North Idaho, Silverwood Theme Park has over 70 rides, slides, shows and attractions, including four roller coasters, Boulder Beach Water Park, a steam engine train, live entertainment, restaurants, and more.

Price for tickets and transportation: *$60 per Person (over 7 years old); $26 per Child (3-7 years old)*

Price for tickets only: *$42 per Person (over 7 years old); $20 per Child (3-7 years old)*

Fly Fishing

1:30pm – 5:30pm *(Meet in Lobby)*

Guests will travel west to the Spokane River where they will be introduced to their guides from Orvis. The Spokane River flows 112 miles from Post Falls, Idaho to Lake Roosevelt (Upper Columbia River) in Washington, and encompasses over 6,000 square miles in Washington and Idaho. As many as 17 fish species can be encountered in the river from Idaho to Nine Mile Dam. Guests will spend the afternoon in search of beautiful rainbow trout.

Price: *$180 per person (Includes all gear, license fees, and transportation) (2 person minimum)*

Show & Tell — Industry Presentation by THINK Surgical

2:25pm – 2:55pm *(Foyer)*

Active Robotics in Total Joint Replacement

Presented by Douglas Unis, MD

Wine, beer and soda provided.

*CME Credit Not Available

Price: *Included in Registration Fee*

Masterclass of North West Wines with Sommelier

3:00pm – 4:30pm *(Meet in Lobby)*

Not your typical wine tasting. This is a "light bulb" tasting event in that it will reveal to the participant that he/she instinctively knows about how flavor works. The class will demonstrate flavor in the context of the participant's preference, not some wine guy's preference, which will make it all the more memorable. The wines will be chosen to characterize the various tasting notes and will represent some of the North West's clearest examples of these flavor styles making them excellent illustrators, as well as instructive, to finding a person's preference. The wines will be accompanied by some of the finest cheeses the region has to offer.

Price: *$35 per person (10 person minimum)*

Family Gala Reception and Dinner Dance

6:15pm – 7:00pm Reception *(Lakeview Terrace)*

7:00pm – 11:00pm Dinner Dance *(Bay Rooms 4-5)*

Enjoy the sunset, then the stars and let's get the party started! This is the night to let your hair down and have some fun with your friends and colleagues. There will be a fabulous band, dinner and drinks, and don't forget to bring your dance moves.

Attire: Jackets (no ties required)

Price: *Included in Registration Fee or $125 per Unregistered Adult Guest; $50 per Unregistered Child (5-17)*

Call the Concierge at 208-415-5680 for additional activities, including biking, boating, water skiing, hiking and seaplane riding.

Meeting Information

FORMAT

The educational sessions will be held Thursday, Friday, and Saturday, July 30 – August 1, 2015, from approximately 7:00am until 1:30pm, at The Coeur d'Alene Hotel in Coeur d'Alene, Idaho.

TARGET AUDIENCE

The 79th 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 29.25 ***AMA PRA Category 1 Credits™***. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

* 18 CME credits for Scientific Program
* 5.75 CME credits for Scientific Poster Sessions
* 5.5 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 2015 Annual Meeting CME Credit Records. CME Certificates will be awarded to all registered participants.

PHYSICIAN REGISTRATION FEE

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

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.

2015 Howard Steel Lecturer

Kevin Leman, PhD

WOA is pleased to have Psychologist Dr. Kevin Leman, as its Howard Steel Lecturer for the 79th Annual Meeting. Internationally known psychologist, business consultant, radio and television personality, speaker, award winning author of nearly 50 books and New York Times Bestselling author of *Have a New Kid by Friday*, Dr. Kevin Leman has taught and entertained audiences worldwide with his wit and common sense psychology.

A frequent contributor to *Fox & Friends*, Dr. Leman has also made house calls for hundreds of radio and television programs including *Oprah, CBS This Morning, Live With Regis And Kelly, CNN, Today, The View,* and *Focus on the Family* and served as a consulting family psychologist to *Good Morning America.* He has shared the platform with such diverse personalities as Steve Forbes, and Regis Philbin. Dr. Leman has been a featured speaker at Top of the Table, YPO University, and several Young Presidents' Organizations chapters around the United States and Canada. Dr. Leman has also presented to IBM School of Management, Cincinnati Financial Corporation, Pennsylvania Banker's Association, Pepsi-Cola, Pizza Hut, Million Dollar Round Table, Tambrands and McDonald's, to name a few. Dr. Leman is the founder and president of "Couples of Promise," an organization designed and committed to helping couples remain happily married.

Some of his best-selling titles include:

- Have a Happy Family by Friday
- Be the Dad She Needs You to Be
- The Birth Order Book
- Have a New Kid by Friday
- Have a New Teenager by Friday
- Have a New Husband by Friday
- Have a New You by Friday
- The Way of the Shepherd
- The Way of the Wise
- Parenting Your Powerful Child
- What a Difference a Mom Makes
- What Your Childhood Memories Say about You
- Making Children Mind without Losing Yours
- Sheet Music – Uncovering the Secrets of Sexual Intimacy in Marriage

Dr. Leman received his Bachelor's degree in psychology from the University of Arizona, where he later earned his Master's and Doctorate degrees. Former Head Resident and Assistant Dean of Students at the University of Arizona, Dr. Leman is the recipient of the highest award given by the University of Arizona to their own, the Alumni Achievement Award. Dr. Leman also attended North Park University, where he was the recipient of North Park's 1993 Distinguished Alumnus Award and was also awarded a Doctor of Humane Letters degree in 2010. Dr. Leman's professional affiliations include the American Federation of Television and Radio Artists and the North American Society of Adlerian Psychology. Originally from Williamsville, New York, he and his wife, Sande, live in Tucson, Arizona. They have five children and two grandchildren.

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Western Orthopaedic Association
Contributions — June 1, 2014 to May 31, 2015

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WOA First Business Meetings

Western Orthopaedic Association

Bay Rooms 4-5
The Coeur d'Alene Hotel
Coeur d'Alene, Idaho

Thursday, July 30, 2015
Paul C. Collins, MD, President, Presiding

AGENDA

I. Call to Order

II. Report of the President, Paul C. Collins, MD

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

IV. Report of the Treasurer/Historian, Nitin N. Bhatia, 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 2015 Nominating Committee and Proposed Slate of Officers for 2015-2016, Valerae O. Lewis, MD

VII. Election of the 2016 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.

2014-2015 Committee - Ineligible	2015- 2016 Committee
Valerae O. Lewis, MD, *Chair*	Paul C. Collins, MD, *Chair*
Michael R. Dayton, MD	Basil Besh, MD
Payam Tabrizi, MD	Jennifer Van Warmerdam, MD
Jeffrey M. Nakano, MD	1. Nominee
Meghan Imrie, MD	2. Nominee
Reza Firoozabadi, MD	3. Nominee
Cynthia M. Kelly, MD	4. Nominee

VIII. Old Business

IX. New Business

X. Announcements

XI. Adjournment

Minutes of the 2014 First Business Meeting of the Western Orthopaedic Association

The Fairmont Orchid
Big Island, Hawaii
Thursday, July 31, 2014

Valerae O. Lewis, MD, President, presiding

CALL TO ORDER AND REPORT OF THE PRESIDENT

Dr. Lewis called the meeting to order at 6:10 am. She welcomed everyone to the meeting and thanked Bryan Moon and Melvyn Harrington for developing such an excellent Scientific Program.

REPORT OF THE SECRETARY

Dr. Jewett reported on the Minutes. He stated the 2013 First and Second Business Meeting Minutes are in the Syllabus on pages 23 and 25 for review and approval.

ACTION: It was moved and seconded that the Minutes for the 2013 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 in a healthy financial position. The first six months show a profit of $73,000, and the year is projected to be profitable. 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 WOA membership. With membership being down, Dr. Kelly asked the attendees to bring new members to the WOA. She said that there are 789 active members which is down from 868 in 2013. On a positive note, the renewal rate is up to 90.9% over last year's rate of 73.1%. Dr. Kelly said that new members would be recognized at the New Member Reception and encouraged the new members to attend.

REPORT OF THE 2014 NOMINATING COMMITTEE

Dr. Raney reported that the 2014 Nominating Committee has met and presented the proposed Slate of Officers for 2014-2015.

President	Paul C. Collins, MD
First Vice-President	William L. Maloney III, MD
Second Vice President	Robert R. Slater Jr., MD
Secretary	Brian A. Jewett, MD
Treasurer	Nitin N. Bhatia, MD
Members at Large	Jay R. Lieberman, MD
Junior Board Members:	Jeffrey E. Krygier, MD
	James Van den Bogaerde, MD
Membership Committee:	Jeffrey M. Nakano, MD
	Montri D. Wongworawat, MD

Nominations for the 2015 Nominating Committee were held. Three members were nominated from the floor to serve on the 2015 Nominating Committee.

Dr. Megan Emory

Dr. Reza Firoozabadi

Dr. Cynthia Kelly

ACTION: It was moved and seconded to close the nominations for the 2015 Nominating Committee. The motion carried.

ACTION: It was moved and seconded to approve the nominations for the 2015 Nominating Committee. The motion carried.

ANNOUNCEMENTS

Dr. Lewis encouraged everyone to attend the New Member and Welcome Receptions and Dr. Springfield's and Dr. Willett's presentations.

ADJOURNMENT

There being no further business to discuss, Dr. Lewis adjourned the meeting at 6:20 am.

WOA Second Business Meetings

Western Orthopaedic Association

Bay Rooms 4-5
The Coeur d'Alene Hotel
Coeur d'Alene, Idaho

Saturday, August 1, 2015
Paul C. Collins, MD, President, Presiding

AGENDA

I. Call to Order
II. Presentation of the Proposed Slate of Officers for 2015-2016, Valerae O. Lewis, MD
III. Election of Officers, Paul C. Collins, MD
IV. Old Business
V. New Business
VI. Announcements
VII. Installation of 2015-2016 President, John R. Tongue, MD by Paul C. Collins, MD
VIII. Adjournment

Minutes of the 2014 Second Business Meeting of the Western Orthopaedic Association

The Fairmont Orchid
Big Island, Hawaii
Saturday, August 2, 2014

Valerae O. Lewis, MD, President, presiding

CALL TO ORDER

Dr. Lewis called the meeting to order at 6:50 am. She thanked the Program Chairs for doing such an awesome job on the meeting and the PAs for all of their efforts. She encouraged the PAs to bring other PAs to the meeting.

ELECTION OF OFFICERS

Dr. Raney presented for approval the proposed Slate of Officers for 2014-2015:

President	Paul C. Collins, MD
First Vice-President	William L. Maloney III, MD
Second Vice President	Robert R. Slater Jr., MD
Secretary	Brian A. Jewett, MD
Treasurer	Nitin N. Bhatia, MD
Members at Large	Jay R. Lieberman, MD
Junior Board Members:	Jeffrey E. Krygier, MD
	James Van den Bogaerde, MD
Membership Committee:	Jeffrey M. Nakano, MD
	Montri D. Wongworawat, MD

ACTION: It was moved and seconded to approve the Slate of Officers for 2014-2015 as presented. The motion carried.

INSTALLATION

Dr. Lewis invited Dr. Paul Collins from Idaho to join her at the podium as the 2015 President of WOA. Dr. Lewis presented Dr. Collins with the Presidential medal. Following this presentation, Dr. Collins thanked Dr. Lewis for her efforts during the past year and presented her with the Past President's pin.

ADJOURNMENT

Dr. Valerae Lewis encouraged everyone to visit the exhibits. With no further business to be addressed, the meeting adjourned at 6:57 am.

Western Orthopaedic Association

Scientific Program

July 30-August 1, 2015

The Coeur d'Alene Hotel
Coeur d'Alene, Idaho

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

2015 Program Chair

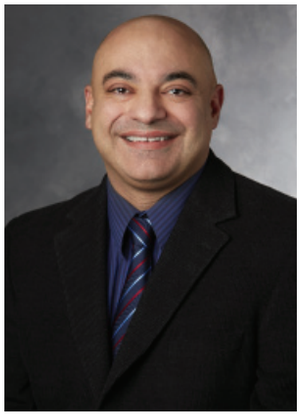
Payam Tabrizi, MD

San Jose, CA

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	Melvyn A. Harrington, Jr., MD	Houston, TX
	Bryan S. Moon, MD	Houston, TX

2015 Program Chair



Payam Tabrizi, MD
San Jose, California

Payam Tabrizi, MD, FRCS(C), was born in Tehran, Iran and migrated with his family to Ottawa, Canada in 1977, where he spent his formative years. He finished his medical school and Orthopaedic residency at the University of Ottawa, as well as a Tumour and Arthroplasty Fellowship at the Ottawa General Hospital. This was followed by an Orthopaedic Trauma Fellowship at the Royal Adelaide Hospital in Australia in 2000-2001. Upon returning to North America, he has subsequently worked at Santa Clara Valley Medical Center, a level 1 trauma hospital in San Jose, CA where he is the Director of Orthopaedic Trauma. He is also a Clinical Assistant Professor of Orthopaedic Surgery at Stanford University, and takes pride in teaching the next generation of Orthopaedic surgeons. He is looking forward to a fun and educational conference and meeting some of you in person.

2015 Presidential Guest Speaker

Douglas W. Jackson, MD

Long Beach, California

WOA Past Guest Speakers

1954	Jack W. Wickstrom, MD	New Orleans, LA
1955	Paul R. Lipscomb, MD	Davis, CA
1956	Carroll B. Larson, MD	Iowa City, IA
1957	John Saunders, MD	San Francisco, CA
	Rutherford S. Gilfillan, MD	San Francisco, CA
1961	George Eggers, MD	Galveston, TX
1964	D. L. Griffiths, FRCS	Manchester, England
1965	Don H. O'Donoghue, MD	Oklahoma City, OK
1966	George J. Garceau, MD	Indianapolis, IN
1967	H. Relton McCarroll, MD	St. Louis, MO
1968	William T. Green, MD	Boston, MA
1969	Leonard F. Peltier, MD	Tuscon, AZ
1970	James W. Harkess, MD	Louisville, KY
1971	Peter F. Williams, FRCS	Parkville, Australia
	O. Ross Nicholson, FRCS, FRACS	Auckland, New Zealand
1972	James A. Nicholas, MD	New York, NY
	Joseph A. Boyes, MD	Los Angeles, CA
1973	Lowell Peterson, MD	Rochester, MN
	Charles J. Sedgewick, DVM	San Diego, CA
1974	Gerald S. Laros, MD	Chicago, IL
1975	J. William Fielding, MD	New York, NY
1976	W. Robert Harris, MD	Toronto, Canada
1977	Federico Labbe, MD	Guatemala City, Guatemala
	Thomas E. Whitesides Jr., MD	Atlanta, GA
1978	Edward H. Simmons, MD	Toronto, Canada
1979	Ejnar Eriksson, MD	Stockholm, Sweden
1980	Ralph B. Cloward, MD	Honolulu, HI
	Cheng Hsu-His, MD	Beijing, China
1981	Wayne O. Southwick, MD	New Haven, CT
	Stanley W. Jacob, MD	Portland, OR
1982	Henry J. Mankin, MD	Boston, MA
	Richard J. Smith, MD	Boston, MA
1983	M. Freeman, MD, FRCS	London, England
	Stephen C. Jacobsen, PhD	Salt Lake City, UT
1984	Henry W. Apfelbach, MD	Lake Forest, IL
	William H. Harris, MD	Boston, MA
1985	C. McCollister Evarts, MD	Rochester, NY
	Harlan J. Spjut, MD	Houston, TX
1986	William R. Murray, MD	San Francisco, CA
	Clement B. Sledge, MD	Boston, MA
1987	Rocco A. Calandruccio, MD	Memphis, TN
Maj. Gen. Maurice C. Padden, USAF		Colorado Springs, CO
1988	Quinn H. Becker, MD	Thurmont, MD
	Wu Shou-Yi, MD	Shanghai, Peoples Republic of China
1989	David L. Hamblen, PhD, FRCS	Glasgow, Scotland
	Hon. Justice Burton B. Roberts	Bronx, NY
1990	Benjamin E. Bierbaum, MD	Boston, MA
	Thomas Taylor, FRCS	Sydney, Australia
1991	Professor René K. Marti	Amsterdam, The Netherlands
1992	Ian D. Learmonth, FRCS	Cape Town, South Africa
1993	Christian Gerber, MD	Fribourg, Switzerland
1994	Ian G. Kelly, BSc, MD, FRCS	Glasgow, Scotland
1995	O. Ross Nicholson, FRCS	Auckland, New Zealand
1996	John Leong	Hong Kong, China
	M. Mark Hoffer, MD	Los Angeles, CA
1997	Anthony Pohl	Adelaide, Australia
	Harold K. Dunn, MD	Salt Lake City, UT
1998	Lars Engebretsen, MD	Oslo, Norway
1999	Donald Howie, MBBS	Adelaide, Australia
2000	Lennart Hovelius, MD	Gavle, Sweden
2001	Chitranjan S. Ranawat, MD	New York, NY
2002	Klaus Parsch, MD	Stuttgart, Germany
2003	Charles A. Rockwood Jr., MD	San Antonio, TX
2004	Joseph A. Buckwalter, MD	Iowa City, IA
2005	Robert H. Cofield, MD	Rochester, MN
2006	Marvin Tile, MD, BSc (Med), FRCS(C)	Toronto, Canada
2007	Robert E. Eilert, MD	Denver, CO
2008	Douglas W. Jackson, MD	Long Beach, CA
2009	Frederick A. Matsen III, MD	Seattle, WA
2010	James D. Heckman, MD	Needham, MA
2011	G. Paul DeRose, MD	Durham, NC
2012	Kevin J. Bozic, MD, MBA	San Francisco, CA
2013	Augustus A. White III, MD, PhD	Cambridge, MA
2014	Dempsey S. Springfield, MD	Boston, MA

2015 Presidential Guest Speaker

Douglas W. Jackson, MD

WOA is pleased to welcome Douglas W. Jackson, MD as the 2015 Presidential Guest Speaker. Dr. Jackson, early in his career, established the Long Beach Knee and Orthopaedic Sports Medicine Fellowship Program. He trained over 50 orthopaedic surgeons during their time in that program. In addition, he ran a very busy private practice for over 40 years and was Medical Director of Southern California Center for Sports Medicine for most of those years. He established a free standing private research facility, the Orthopaedic Research Institute at the Memorial Medical Center in Long Beach, California.

Dr. Jackson and Timothy Simon, PhD published extensively on their vast research in the areas of the meniscus, ligaments, tendons and allografts. He went on to serve as president and in leadership roles of many medical organizations including being President of the American Academy of Orthopaedic Surgeons. The past ten years, he served as the Annual Course Director and Editor of *Orthopedics Today*. We look forward to his presentation at WOA's 2015 Annual Meeting.

2015 WOA Award Winners

WOA Resident Award Recipients

Congratulations to the following 2015 WOA Resident/Fellow Award Recipients. The award papers will be presented during the Scientific Program on Saturday 7:35am – 8:25am. The Lloyd Taylor, Vernon Thompson, Harold and Nancy Willingham, Sanford and Darlene Anzel, and Resident Award Winners will be announced Saturday evening.

Christopher Bui, MD
Biomechanical Stability of Glenohumeral Bipolar Bone Lesions After Soft-Tissue Repair

Pascual Dutton, MD
What Is the Most Effective Technique to Stabilize Patients on the Operating Table During Total Hip Arthroplasty (THA)?

Ryan Fader, MD
Fresh Osteochondral Allograft Versus Autograft: 12 Month Results in Isolated Canine Knee Defects

Jason H. Ghodasra, MD, MSCI
The Effect of RhBMP-2 in a Novel, Non-Instrumented Extremity Nonunion Model

Paul M. Lichstein, MD
Static Spacers for Periprosthetic Knee Infection: Inferior Flexion to Articulating Spacers?

Calvin Schlepp, MD
Radiographic Predictors of Posterior Wall Fracture Instability

Alexandra Stavrakis, MD
A Novel Antibiotic Coating in Preventing Periprosthetic Infection

WOA/OREF Young Investigator Award Recipients

Congratulations to the following 2015 WOA/OREF Young Investigator Award Contenders. The papers will be presented during the Scientific Program on Saturday 7:00am – 7:35am. The three award winners will be announced Saturday evening

Hamed Yazdanshenas, MD
Treatment and Post-Surgery Functional Outcome of Spaghetti Wrist

Geoffrey Marecek, MD
Use of a Defined Surgical Approach in the Debridement of Open Tibia Fractures

Anna N. Miller, MD
Sacral Dysmorphism in Patients with Spinopelvic Dissociation

Reza Firoozabadi, MD, MA
The Hyperextension Varus Bicondlyar Tibial Plateau Fracture

Emilie V. Cheung, MD
Comparison of "Ideal" Implant Placement and Clinical Implant Placement

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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Mark R. Adams, MD *(n.)*
Remi M. Ajiboye, MD *(n.)*
Masaki Akeda, MD *(n.)*
Bryce Allen, MD *(n.)*
Timothy B. Alton, MD *(n.)*
Derek Amanatullah, MD, PhD *(3b. Sanofi; 7. Medscape)*
Catherine Ambrose, PhD *(n.)*
Harlan Amstutz, MD *(1. Wright Medical Technology, Inc.)*
Mark Anderson, MD *(n.)*
Scott R. Anderson, MD *(n.)*
Robert T. Arrigo, BS, MS *(n.)*
COL (Ret) Edward D. Arrington, MD *(6. Geneva Foundation and Henry M. Jackson Foundation for the Advancement of Military Medicine)*
Robert Atkinson, MD *(4. Abbott, Eli Lilly, Merck)*

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Raffi S. Avedian, MD *(3b. Plexicon)*
Peter M. Axelsson, MD *(n.)*
Derek Axibal, PGY1 *(n.)*
Alfonso E. Ayala, BS *(n.)*
Kodi K. Azari, MD, FACS *(n.)*
Glen Baird, MD *(n.)*
Todd Balog, MD *(n.)*
David Barei, MD *(2. Synthes; 3b. Synthes; 5. Synthes, Zimmer)*
William L. Bargar *(2. Think Surgical Inc.; 3a. Sutter Health, Think Surgical Inc.; 4. Johnson & Johnson, Stryker, Biomet, Zimmer; 5. DePuy, Curexo Technology Corporation)*
Jonathan C. Barnwell, MD *(n.)*
Jeffrey J. Barry, MD *(n.)*
Betsey K. Bean, DO *(n.)*
Jennifer E. Beck, MD *(n.)*
Giles W. Becker, MA MB BChir FRCS (Tr and Orth) *(n.)*

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Neal Berger, MD *(n.)*
Derek T. Bernstein, MD *(n.)*
Nicholas M. Bernthal, MD *(3b. daiichi sankyo)*
Nitin N. Bhatia, MD *(1. Alphatec Spine, Biomet, Seaspine, Stryker; 2. Alphatec Spine, Biomet, Seaspine, Spineart, Stryker; 3b. Alphatec Spine, Biomet, DiFusion, Seaspine, Spineart, Zimmer, Stryker; 4. DiFusion; 5. Alphatec Spine, Seaspine)*
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Thomas Blumenfeld *(1. DePuy; 2. DePuy; 5. DePuy)*
Benjamin Bluth, MD *(n.)*
Daniel V. Boguszewski, PhD *(3b. Musculoskeletal Transplant Foundation; 5. Musculoskeletal Transplant Foundation)*
Christopher Boone, MD *(2. Synthes)*
Jeffrey L. Brewer, MD *(n.)*
Michael R. Briseno, MD *(n.)*
William B. Bronson, MD *(n.)*
David Brown, BS *(n.)*
Matthew D. Budge, MD *(n.)*
Richard Buckley, MD *(n.)*
Christopher Bui, MD *(n.)*
Geert Buijze, MD, PhD *(n.)*
Susan Bukata, MD *(2. Eli Lilly, Merck; 3b. Eli Lilly, Amgen Co; 5. Eli Lilly, Amgen Co.)*
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LTC Lisbeth Bush, MD *(n.)*
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Michael J. Dempewolf, DO, MBA *(n.)*
Gregory L. DeSilva, MD *(4. Pfizer)*

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Claire D. Eliasberg, BA *(n.)*

Daniel M. Elkin, MD *(n.)*

Noah Epstein, MD *(n.)*

Melissa Esparza, MD *(n.)*

E. Burke Evans, MD *(n.)*

Denis Evseenko, MD, PhD *(n.)*

Ryan Fader, MD *(6. National Football League Charities, Smith & Nephew)*

Frances Farley, MD *(4. Medtronic; 5. Genzyme, Johnson & Johnson, Pfizer, Medtronic, Stryker, Synthes, Wright Medical Technology, Inc., Zimmer)*

Brian Farrell, MD *(n.)*

Brian T. Feeley, MD *(5. Orthofix, Inc.)*

Robert J. Feibel, MD *(n.)*

Matthew P. Ferguson, MD *(n.)*

Blair Filler, MD *(4. Johnson & Johnson, Merck, Pfizer)*

Reza Firoozabadi, MD, MA *(n.)*

Russell Flato, BS *(n.)*

C. Timothy Floyd, MD, FACS *(4. St. Teresa Medical, Inc.)*

T. Ty Fowler, MD *(2. Synthes; 5. Synthes)*

Chuck Freitag, WOA Staff ***(7. Data Trace Publishing Company; 8. Data Trace Publishing Company; 9. Data Trace Publishing Company)***

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CPT (P) Joseph W. Galvin, DO *(n.)*

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Goutham Ganesan, BS *(n.)*

Cameron A. Garagozlo *(n.)*

Tanya C. Garcia-Nolen, BS, MS *(n.)*

John Garlich, MD *(n.)*

Joshua L. Gary, MD *(2. Smith & Nephew; 4. Summitt Medventures)*

Mark Ghamsary, PhD *(n.)*

Jason H. Ghodasra, MD, MSCI *(n.)*

Jeremy Gililland, MD *(3c. OrthoGrid; 4. OrthoGrid; 5. Angiotech, Biomet)*

Nicholas J. Giori, MD *(n.)*

Edward Glenn, MD *(n.)*

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Accreditation Information for the Scientific Program

PROGRAM COMMITTEE

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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, Upper Extremity and Practice Management areas will be addressed through a combination of general sessions and symposia offering discussions, guest lectures and scientific abstract presentations. After reviewing the needs assessment and the 2014 program critique, the Program Committee of the WOA has created a program for 2015 that will afford orthopaedic and their allied health professional colleagues the opportunity to:

1. Foster a collegial and stimulating exchange of ideas between the presenters, the faculty and the participants through paper presentations, instructional symposia, case-based debate discussions, multimedia educational sessions, and poster exhibits.
2. Describe and employ an outcome based rationale for the treatment of both common and complex orthopaedic traumatic injuries.
3. Discuss the current trends in the treatment of degenerative and athletic conditions, including non-operative management, fusion and total joint arthroplasty.
4. Obtain knowledge on frequently encountered spinal disorders and their treatment.
5. Outline the role of the orthopaedic surgeon in the diagnosis and treatment of common metabolic disorders, including osteoporosis, as well as an update on orthopaedic infections.
6. Review current controversies in practice management and the value of orthopaedic surgery as a career choice.

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. Please plan to visit the Scientific Posters.

MULTIMEDIA EDUCATION

Multimedia education materials will be offered on Thursday, Friday, and Saturday afternoon. A comprehensive selection of AAOS videos will be available for your individual education.

CME ACCREDITATION

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership 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 29.25 ***AMA PRA Cat-***

egory 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

* 18 CME credits for Scientific Program
* 5.75 CME credits for Scientific Poster Sessions
* 5.5 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 2015 Annual Meeting CME Credit Records. CME Certificates will be awarded to all registered participants.

CEC CREDIT

Physicians Assistants can receive up to 29.25 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, complete the WOA 2015 Annual Meeting CME Record Form online at www.woa-assn.org; otherview your CME credit hours cannot be certified.

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.

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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 pharmaceuticals or medical devices 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.

2015 Scientific Program

Bay Rooms 4-5 (unless otherwise specified)

Wednesday, July 29, 2015

Disclosure Information is listed on pages 35-41.

5:00pm – 7:00pm WOA Workshop / Skills Lab — Distal Femur Fractures (Plate versus IMN) *(Kidd Island Bay)*

Thursday, July 30, 2015

Disclosure Information is listed on pages 35-41.

5:50am – 6:50am **Scientific Poster Session** *(Bay Room 1)*
Note: Presenters will be available to answer questions.

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

7:05am – 7:10am **Welcome**
Paul C. Collins, MD, President
Payam Tabrizi, MD, Program Chair

General Session 1 — Upper Extremity Trauma Debates (ARS)

Moderator: Payam Tabrizi, MD, *Santa Clara Valley Orthopedics, San Jose, CA*

7:10am – 7:35am **Scaphoid Fractures**

Non-Op
Jeffrey D. Seip, MD, Orthopedic Specialty Center, Yucca Valley, CA

ORIF
David C. Hay, MD, Kerlan-Jobe Orthopaedic Clinic, Anaheim, CA

7:35am – 8:00am **4 Part Proximal Humerus Fractures**

Non-Op
Andrew M. Choo, MD, University of Texas Health Science Center, Houston, TX

ORIF
James D. Kelly II, MD, San Francisco Shoulder, Elbow and Hand Clinic, San Francisco, CA

Arthroplasty
Emilie V. Cheung, MD, Stanford School of Medicine, Red Wood City, CA

8:00am – 8:20am **Break — Please visit Exhibits** *(Bay Rooms 2-3)*

General Session 2 — Orthopaedic Practice Patterns & National Trends: Part 1

Moderator: Thomas J. Christensen, MD, *Reno Orthopaedic Clinic, Reno, NV*

8:20am – 8:26am Preferences and Trends for Elective Surgery on Nicotine Users Amongst Orthopaedic Surgeons
Matt Lilley, MD, The Taylor Collaboration, San Francisco, CA

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

Thursday, July 30, 2015

Disclosure Information is listed on pages 35-41.

8:26am – 8:32am — Treatment Trends and Complication Rates Following Humeral Shaft Fractures,
Claire D. Eliasberg, BA, University of California at Los Angeles, Los Angeles, CA

8:32am – 8:38am — Pediatric Supracondylar Humerus Fractures: Does After-Hours Treatment Influence Outcomes?
Gabrielle M. Paci, MD, Stanford School of Medicine, Redwood City, CA

8:38am – 8:44am — Open Shoulder Stabilization: Current Trends and Post-Operative Complications
Adam Z. Khan, BS, Los Angeles, CA

8:44am – 8:54am — Total Elbow Arthroplasty – Current Indications, Trends, and Controversies
Thomas J. Christensen, MD, Reno Orthopaedic Clinic, Reno, NV

8:54am – 9:00am — Discussion

Concurrent PA Session 1 *(Bay Room 6)*

Moderator: David H. Chafey, MD, *University of New Mexico School of Medicine, Albuquerque, NM*

8:45am – 9:45am — Workshop / Skills Lab
Proximal Humerus
(ORIF vs Arthroplasty)

9:00am – 9:05am — **Go to Rapid Fire Stations**

Rapid Fire Session 3A — Basic Science *(Foyer)*

Moderator: Langdon A. Hartsock, MD, *Medical University of South Carolina, Charleston, SC*

9:05am – 9:09am — Hypoxic Culture Conditions Induce Increased Metabolic Rate and Collagen Gene Expression in ACL-Derived Cells
Natalie L. Leong, MD, University of California at Los Angeles, Los Angeles, CA

9:09am – 9:13am — Biomechanical Comparison of Placement Density with an All Suture and Traditional Anchors
John Rodriguez, MD, The Taylor Collaboration, San Francisco, CA

9:13am – 9:17am — Optimizing Compression: Comparing Eccentric Plate Holes and External Tensioning Device
Justin F. Lucas, MD, UC Davis Health Center, Sacramento, CA

9:17am – 9:25am — Discussion

9:25am – 9:29am — Locking Plates Stability: A Biomechanical Effect of Variable Cortical Contact
Zackary D. Vaughn, MD, Stanford School of Medicine, Redwood City, CA

9:29am – 9:33am — Fracture Healing in a Mouse Model Exposed to Pegylated-NELL
Elizabeth L. Lord, MD, University of California at Los Angeles, Los Angeles, CA

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

Thursday, July 30, 2015

Disclosure Information is listed on pages 35-41.

9:33am – 9:37am Reamed Femoral Intramedullary Nail Affects Trauma Induced Coagulopathy Based on Thromboelastography
Prism Schneider, MD, PhD, FRCS(C), Hermann Memorial Hospital University of Texas, Houston, TX

9:37am – 9:45am Discussion

Rapid Fire Session 3B — Hip *(Foyer)*

Moderator: Howard A. Chansky, MD, *University of Washington, Seattle, WA*

9:05am – 9:09am Accuracy of Ultrasound-Guided Intra-Articular Hip Injections Performed in the Orthopaedic Clinic
Eric K. Turner, MD, Madigan Army Medical Center, Tacoma, WA

9:09am – 9:13am Subcutaneous Hip Fat Distribution in Relation to THA Surgical Approach
Gregory Sprowls, BS, Scott and White Healthcare/College of Medicine, Texas A&M Health Science Center, Temple, TX

9:13am – 9:17am Perioperative Outcomes of Total Hip Arthroplasy After Lumbar Spinal Fusion
Jeffrey J. Barry, MD, University of California, San Francisco, San Francisco, CA

9:17am – 9:25am Discussion

9:25am – 9:29am Initial Stiffness of Fixation in Vancouver C Periprosthetic Fractures
D. Andrew Hulet, BS, University of Utah, Salt Lake City, UT
**Presented by Sean Thayne Tagge*

9:29am – 9:33am Acetabular Revision Using a Cementless Protrusio Shell: Radiographic Analysis & Survivorship at Mid-Term Follow-Up
Chase Bennett, MD, Sutter General Hospital, Sacramento, CA

9:33am – 9:37am Outcome of Hip Fracture Care in Elderly Patients in a Senior Managed Care System
Hamed Yazdanshenas, MD, University of California at Los Angeles, Los Angeles, CA

9:37am – 9:45am Discussion

Rapid Fire Session 3C — Pediatrics *(Foyer)*

Moderator: Walter F. Krengel III, MD, *Seattle Children's Hospital, University of Washington, Seattle, WA*

9:05am – 9:09am Necessity of Postoperative Radiographs Prior to Pin Removal Following Surgical Treatment of Supracondylar Humerus Fractures
Michael J. Dempewolf, DO, MBA, Children's Hospital of Orange County, Orange, CA

9:09am – 9:13am Revision Surgery Rates After Primary Fusion for Adolescent Idiopathic Scoliosis
Joseph H. Dannenbaum IV, MD, Shriner's Hospital for Children, Spokane, WA

9:13am – 9:17am Results of Early Hip Reconstructive Surgery in Severely Involved Children with Cerebral Palsy
Betsy K. Bean, DO, Shriner's Hospital for Children, Spokane, WA

9:17am – 9:25am Discussion

9:25am – 9:29am Severity of Asynchronous SCFE in Skeletally Immature Versus Mature Patients
Gregory Strohmeyer, MD, University of New Mexico School of Medicine, Albuquerque, NM/Helen Devos Children's Hospital, Grand Rapids, MI
**Presented by Lisa Toelle, BS*

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

Thursday, July 30, 2015

Disclosure Information is listed on pages 35-41.

9:29am – 9:33am — Success of Fixation of Pediatric Supracondylar Femur Fractures with Fracture Non-Specific Implants
Meghan Imrie, MD, Lucile Packard Children's Hospital at Stanford, Stanford, CA

9:33am – 9:37am — Treatment Guidelines for Acute Pediatric Musculoskeletal Infections: Worth the Effort?
Murray D. Spruiell, MD, Children's Hospital of Colorado/University of Colorado School of Medicine, Aurora, CO

9:37am – 9:45am — Discussion

Rapid Fire Session 3D — Sports (Knee) *(Foyer)*

Moderator: Omer Ilahi, MD, *Texas Arthroscopy and Sports Medicine Institute, Houston, TX*

9:05am – 9:09am — Gender Differences in Knee Flexion Angle While Running
Christopher L. Sheu, MD, The University of Texas Medical Branch, Galveston, TX
**Presented by David Brown, BS*

9:09am – 9:13am — Predictors of Orthopaedic Surgery in NCAA Athletes
Dean Wang, MD, David Geffen School of Medicine at University of California at Los Angeles, Los Angeles, CA
**Presented by Caitlyn M. Rugg, MD*

9:13am – 9:17am — Delayed Anterior Cruciate Ligament Reconstruction in Pediatric Tibial Spine Fractures
Meredith Mayo, MD, University of Colorado School of Medicine, Aurora, CO

9:17am – 9:25am — Discussion

9:25am – 9:29am — The Effect of Autologous Hamstring Graft Diameter on Likelihood for Revision of Anterior Cruciate Ligament Reconstruction
Lindsey Spragg, MD, Kaiser Baldwin Park, Baldwin Park, CA

9:29am – 9:33am — Osteochondral Allograft Donor-Host Matching by Femoral Condyle Radius of Curvature
Derek T. Bernstein, MD, Houston Methodist Hospital, Houston, TX

9:33am – 9:37am — Perioperative Management and Treatment Costs of Knee Articular Cartilage Lesions
Joanne Y. Zhang, BA, David Geffen School of Medicine at University of California at Los Angeles, Los Angeles, CA

9:37am – 9:45am — Discussion

9:45am – 10:05am — **Break — Please visit Exhibits** *(Bay Rooms 2-3)*

General Session 4 — Howard Steel Lecturer

Moderator: Paul C. Collins, MD, *Boise, ID*

10:05am – 10:55am — Making Sense of the Man or Woman in Your Life
Kevin Leman, PhD, Tucson, AZ

Symposium 1 — Basic Science
"She Blinded Me with Science" – Thomas Dolby (1982)

Moderator: Douglas W. Jackson, MD, *Long Beach, CA*

10:55am – 11:10am — Metabolic Bone Disease
Susan Bukata, MD, University of California at Los Angeles, Los Angeles, CA

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

Thursday, July 30, 2015

Disclosure Information is listed on pages 35-41.

11:10am – 11:25am Bisphosphonates
Jeffrey E. Krygier, MD, Santa Clara Valley Medical Center, San Jose, CA

11:25am – 11:40am Osteomyelitis and Infected Non-Unions
Robert J. Feibel, MD, University of Ottawa, Ottawa, ON

11:40am – 11:45am Discussion

11:45am – 12:45pm **WOA Luncheon — Industry Presentation by Mallinckrodt Pharmaceuticals**
*CME Credit Not Available

Symposium 2 — Foot & Ankle
"Footloose" – Kenny Loggins (1984)

Moderator: Michael J. Coughlin, MD, *Saint Alphonsus Medical Group Foot & Ankle, Boise, ID*

12:45pm – 1:15pm **Ankle Arthritis Debate (ARS)**

Fusion
Glen B. Pfeffer, MD, Cedar Sinai Medical Center, Los Angeles, CA

Arthroplasty
Charles L. Saltzman, MD, University of Utah Health Care, Salt Lake City, UT

1:15pm – 1:22pm Achilles Tendon Injuries in NFL Players
Michael J. Coughlin, MD, Saint Alphonsus Medical Group Foot & Ankle, Boise, ID

1:22pm – 1:30pm Extremity Trauma: Mobile Forward Surgical Team
C. Timothy Floyd, MD, FACS, Fairchild AFB, Spokane, WA

1:30pm – 1:40pm Discussion

1:40pm – 4:00pm **Multimedia Education Session**
(North Cape Bay Room)

4:00pm – 5:00pm **Scientific Poster Tours — Upper Extremity** *(Bay Room 1)*
Note: Presenters will be available to answer questions.

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

Friday, July 31, 2015

Disclosure Information is listed on pages 35-41.

6:00am – 7:00am **Scientific Poster Session** *(Bay Room 1)*
Note: Presenters will be available to answer questions.

General Session 5 — Lower Extremity Trauma Debates (ARS)

Moderator: Robert Dunbar, MD, *University of Washington, Harborview Medical Center, Seattle, WA*

7:00am – 7:25am **Proximal Tibia Fractures**

Plate Fixation
Carla S. Smith, MD, Providence Orthopedics, Spokane, WA

IMN
Darius Viskontas, MD, University of British Columbia, New Westminster, BC

7:25am – 7:50am **Calcaneal Fractures**

Non-Op / Percutaneous Fixation
Julius A. Bishop, MD, Stanford School of Medicine, Red Wood City, CA

ORIF
Richard Buckley, MD, University of Calgary, Calgary, AB

Fusion
Patrick Yoon, MD, Hennepin County Medical Center, University of Minnesota, Minneapolis, MN

Concurrent PA Session 2 *(Bay Room 6)*

Moderator: Kristi K. Posey, PA-C, ATC-LAT, *MD Anderson Cancer Center, Houston, TX*

7:00am – 7:50am Adolescent Injuries
James G. Gamble, MD, PhD, Stanford School of Medicine, Redwood City, CA

7:50am – 8:10am **Break — Please visit Exhibits** *(Bay Rooms 2-3)*

General Session 6 — Orthopaedic Practice Patterns & National Trends: Part 2

Moderator: Christopher Boone, MD, *Bellevue, WA*

8:10am – 8:16am Current Trends in Treatment and Outcomes Measurement in CMC Osteoarthritis
Elizabeth Lieberman, MD, Oregon Health and Science University, Portland, OR

8:16am – 8:22am Demographic Trends and Complication Rates in Arthroscopic Elbow Surgery
Natalie L. Leong, MD, University of California at Los Angeles, Los Angeles, CA

8:22am – 8:28am Operative Versus Non-Operative Treatment of Clavicle Fractures — National Trends & Complications
Chad R. Ishmael, MD, University of California at Los Angeles, Los Angeles, CA
**Presented by Claire D. Eliasberg, BA*

8:28am – 8:34am CMN vs. DHS for Fixation of AO 31A1/2 Intertrochanteric Fractures
Michael J. Beebe, MD, BS, University of Utah, Salt Lake City, UT
**Presented by Sean Thayne Tagge*

8:34am – 8:40am Operatively Treated Talus Fractures: Complications and Survivorship in a Large Patient Sample
Michael Stone, MD, University of Southern California Keck School of Medicine, Los Angeles, CA

8:40am – 8:50am Discussion

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

Friday, July 31, 2015

Disclosure Information is listed on pages 35-41.

Concurrent PA Session 3 *(Bay Room 6)*

Moderator: Kristi K. Posey, PA-C, ATC-LAT, *MD Anderson Cancer Center, Houston, TX*

8:40am – 9:35am — The Ironman Athlete/Acute on Chronic Injuries
Thomas K. Miller, MD, Virginia Tech Carilion School of Medicine, Roanoke, VA

8:50am – 8:55am — **Go to Rapid Fire Stations**

Rapid Fire Session 7A — Academics *(Foyer)*

Moderator: T. Ty Fowler, MD, *Mount Carmel Medical Center, Columbus, OH*

8:55am – 8:59am — The Role of Peer Reviewed Research in the Orthopaedic Surgery Residency Match
Sean T. Campbell, MD, Stanford School of Medicine, Redwood City, CA

8:59am – 9:03am — The Ability of a Teaching Skills Education Program to Improve Orthopaedic Residents' Skills as Teachers
Dustin Schuett, DO, Naval Medical Center San Diego, San Diego, CA

9:03am – 9:07am — Objective Evaluation of Motor Skills Training Effectiveness for Orthopaedic Residents Utilizing a Haptic Motion Tracking Drill System
Deana Mercer, MD, University of New Mexico School of Medicine, Albuquerque, NM

9:07am – 9:15am — Discussion

9:15am – 9:19am — Fluoroscopic Image Acquisition Variability During Operative Fixation of Ankle Fractures
Dorothy Harris, MD, The University of Texas Medical Branch, Galveston, TX

9:19am – 9:23am — Risk of Contamination in Orthopaedic Surgical Instruments
Ryan Mayer, BS, University of California, Irvine Medical Center, Orange, CA

9:23am – 9:27am — A Resident-Led Initiative Improves Treatment Rates of Vitamin D Deficiency
Drew Lansdown, MD, University of California, San Francisco, San Francisco, CA
**Presented by Jeffrey A. Barry, MD*

9:27am – 9:35am — Discussion

Rapid Fire Session 7B — Foot & Ankle *(Foyer)*

Moderator: James Meeker, MD, *Oregon Health & Science University, Portland, OR*

8:55am – 8:59am — Does Syndesmosis Fixation Affect the Fibulotalar Relationship?
Nicholas G. Vance, MD, The University of Texas Medical Branch, Galveston, TX

8:59am – 9:03am — Evaluation of the Distal Tibiofibular Joint Using Dynamic Fixation
Ryan O'Shea, MD, The Taylor Collaboration, San Francisco, CA

9:03am – 9:07am — Ankle Fracture Dislocations: The Extruded Distal Tibia
Timothy B. Alton, MD, Harborview Medical Center, Seattle, WA

9:07am – 9:15am — Discussion

9:15am – 9:19am — Biomechanics of Acutrak Screw Fixation of Vertical Medial Malleolus Fractures
Adam M. Wegner, MD, PhD, UC Davis Sacramento California, Sacramento, CA

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

Friday, July 31, 2015

Disclosure Information is listed on pages 35-41.

9:19am – 9:23am — Return to Sport Following Operative Treatment of Osteochondral Talus Lesion
Andrew Jackson, MD, Madigan Army Medical Center, Ft. Lewis, WA
**Presented by Joseph H. Dannenbaum IV, MD*

9:23am – 9:27am — Incidence of Deep Venous Thrombosis in Calcaneal Fractures
Joan R. Williams, MD, University of Washington , Harborview Medical Center, Seattle, WA

9:27am – 9:35am — Discussion

Rapid Fire Session 7C — Spine *(Foyer)*

Moderator: Nitin N. Bhatia, MD, *University of California Irvine, Irvine, CA*

8:55am – 8:59am — A Novel In Vivo Mouse Model of Implant Related Spine Infection
Erik M. Dworsky, MD, University of California at Los Angeles, Los Angeles, CA

8:59am – 9:03am — The 2 Axis Theory of Lumbar Rotation
P. Douglas Kiester, MD, University of California Irvine, Orange, CA

9:03am – 9:07am — The Pedicles Are Not the Densest Regions of the Lumbar Vertebrae
Eric Hohn, MD, St. Mary's Spine Center, San Francisco, CA
**Presented by Ryan O'Shea, MD*

9:07am – 9:15am — Discussion

9:15am – 9:19am — Biomechanical Assessment of L5 Nerve Root Strain in a 3D Printed High-Grade Spondylolisthesis Model
Stephen Keunheng Huo, MD, VA Long Beach Biomechanics Lab, Long Beach, CA
**Presented by Alexander B. Peterson, BA*

9:19am – 9:23am — A Comparison of Anterior and Lateral Approaches for Lumbar Interbody Fusion in the Treatment of Degenerative Spondylolisthesis
Tianyi Wang, MD, Stanford School of Medicine, Redwood City, CA

9:23am – 9:27am — Outcome of Concentrated Bone Marrow Aspirate with Demineralized Bone Matrix and Allograft in Combined Posterolateral and Transforaminal Lumbar Interbody Fusion
Remi M. Ajiboye, MD, University of California at Los Angeles, Los Angeles, CA

9:27am – 9:35am — Discussion

Rapid Fire Session 7D — Shoulder *(Foyer)*

Moderator: James Van Den Bogaerde, MD, *University of California Davis, Sacramento, CA*

8:55am – 8:59am — Benzoyl Peroxide Shoulder Skin Preparation and Deep Colonization with P-Acnes
Wesley Nottage, MD, The Sports Clinic, Laguna Hills, CA

8:59am – 9:03am — Early Complications of Acromioclaviclar Joint Reconstruction Requiring Reoperation
Benjamin Bluth, MD, University of California Los Angeles, Los Angeles, CA

9:03am – 9:07am — Natural History of Isolated Greater Tuberosity Fractures — An MRI Cohort
Christopher Langhammer, MD, PhD, University of California, San Francisco, San Francisco, CA

9:07am – 9:15am — Discussion

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

Friday, July 31, 2015

Disclosure Information is listed on pages 35-41.

9:15am – 9:19am — Progenitor Cells Diminish Fatty Degeneration in Rotator Cuff Tear Model
Claire D. Eliasberg, BA, University of California at Los Angeles, Los Angeles, CA

9:19am – 9:23am — Distal Tibia Radius of Curvature: Does It Match Shoulder Anatomy?
Michael Decker, MD, University of New Mexico School of Medicine, Albuquerque, NM

9:23am – 9:27am — Risk of Nerve Injury During Total Shoulder Arthroplasty: Neuromonitoring Study
Robert L. Parisien, MD, New England Baptist Hospital/Boston University Medical Center, Boston, MA

9:27am – 9:35am — Discussion

9:35am – 9:55am — **Break — Please visit Exhibits** *(Bay Rooms 2-3)*

General Session 8 — Presidential Address and OREF Update

Moderator: Paul C. Collins, MD*, Boise, ID*

9:55am – 10:15am — Needle, Ball, and Airspeed N4071R History of the WOA
Blair Filler, MD, Orthopaedic Institute for Children, Los Angeles, CA

10:15am – 10:25am — ***Presidential Address***
Docendo Discimus (Teach in Order to Learn)
Paul C. Collins, MD, Boise, ID

10:25am – 10:27am — OREF Introduction
Richard F. Santore, MD, University of California San Diego, San Diego, CA

10:27am – 10:40am — OREF Update
Natalie L. Leong, MD, University of California Los Angeles, Los Angeles, CA

10:40am – 10:55am — Flying for Life
John-Curtiss Paul, Warhawk Air Museum, Nampa, ID

Symposium 3 — Hip Arthritis
"Hip to be Square" – Huey Lewis & the News (1986)

Moderator: William J. Maloney III, MD, *Stanford School of Medicine, Redwood City, CA*

10:55am – 11:10am — Joint Preservation Options for the Painful Young Adult Hip
Keith A. Mayo, MD, Harborview Medical Center, University of Washington School of Medicine, Seattle, WA

11:10am – 11:25am — Avascular Necrosis of the Hip
Jay Lieberman, MD, University of Southern California, Los Angeles, CA

11:25am – 11:40am — Metal-On-Metal: Making Sense of Blood Cobalt and Chromium Ion Concentrations
Harlan Amstutz, MD, Joint Replacement Institute, Los Angeles, CA

11:40am – 11:55am — Periprosthetic Fractures
Robert Trousdale, MD, Mayo Clinic, Rochester, MN

11:55am – 12:35pm — **WOA Luncheon — Industry Presentation by DT MedSurg, LLC**
*CME Credit Not Available

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

Friday, July 31, 2015

Disclosure Information is listed on pages 35-41.

Symposium 4 — Complex Periarticular Fractures of the Lower Extremity
"Shattered" – Rolling Stones (1982)

Moderator: Milton "Chip" Routt Jr., MD, University of Texas Health Science Center, Houston, TX

12:35pm – 12:55pm Distal Femur Fractures
Timothy S. Achor, MD, University of Texas, Houston, TX

12:55pm – 1:15pm Tibial Plateau Fractures
Jeffrey M. Smith, MD, San Diego, CA

1:15pm – 1:35pm Pilon Fractures
Sean Nork, MD, University of Washington, Harborview Medical Center, Seattle, WA

1:35pm – 1:40pm Discussion

1:40pm – 4:00pm **Multimedia Education Session** *(North Cape Bay Room)*

4:00pm – 5:00pm **Scientific Poster Tours — Lower Extremity** *(Bay Room 1)*
Note: Presenters will be available to answer questions.

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

Saturday, August 1, 2015

Disclosure Information is listed on pages 35-41.

5:50am – 6:50am **Scientific Poster Session**
(Bay Room 1)
Note: Presenters will be available to answer questions.

6:50am – 7:00am **Second Business Meeting**

General Session 9 — WOA/OREF Young Investigator Awards
"Smooth Operator" – Sade (1984)

Moderator: Geoffrey D. Abrams, MD, *Stanford School of Medicine, Redwood City, CA*

7:00am – 7:06am Treatment and Post-Surgery Functional Outcome of Spaghetti Wrist
Hamed Yazdanshenas, MD, University of California at Los Angeles, Los Angeles, CA

7:06am – 7:12am Use of a Defined Surgical Approach in the Debridement Open Tibia Fractures
Geoffrey Marecek, MD, LA County - USC Medical Center, Los Angeles, CA

7:12am – 7:18am Sacral Dysmorphism in Patients with Spinopelvic Dissociation
Anna N. Miller, MD, Wake Forest Baptist Health, Winston-Salem, NC
**Presented by Milton "Chip" Routt Jr., MD*

7:18am – 7:24am The Hyperextension Varus Bicondlyar Tibial Plateau Fracture
Reza Firoozabadi, MD, MA, Harborview Medical Center, Seattle, WA

7:24am – 7:30am Comparison of "Ideal" Implant Placement and Clinical Implant Placement of Glenoid Component in Shoulder Arthroplasty
Emilie V. Cheung, MD, Stanford School of Medicine, Redwood City, CA

7:30am – 7:35am Discussion

General Session 10 — WOA Resident Awards
"Like a Surgeon" – Weird Al Yankovich (1985)

Moderator: William C. McMaster, MD, *University of California Irvine, Irvine, CA*

7:35am – 7:41am Biomechanical Stability of Glenohumeral Bipolar Bone Lesions After Soft-Tissue Repair
Christopher Bui, MD, VA Long Beach, Long Beach, CA

7:41am – 7:47am Static Spacers for Periprosthetic Knee Infection: Inferior Flexion to Articulating Spacers?
Paul M. Lichstein, MD, Stanford School of Medicine, Redwood City, CA

7:47am – 7:53am A Novel Antibiotic Coating in Preventing Periprosthetic Infection
Alexandra I. Stavrakis, MD, University of California at Los Angeles, Los Angeles, CA

7:53am – 7:59am Radiographic Predictors of Posterior Wall Fracture Instability
Calvin Schlepp, MD, Harborview Medical Center, Seattle, WA

7:59am – 8:05am The Effect of RhBMP-2 in a Novel, Non-Instrumented Extremity Nonunion Model
Jason H. Ghodasra, MD, MSCI, Northwestern University Feinberg School of Medicine, Chicago, IL

8:05am – 8:11am Fresh Osteochondral Allograft versus Autograft: 12 Month Results in Isolated Canine Knee Defects
Ryan Fader, MD, University of Colorado School of Medicine, Denver, CO

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

Saturday, August 1, 2015

Disclosure Information is listed on pages 35-41.

8:11am – 8:17am — What Is the Most Effective Technique to Stabilize Patients on the Operating Table During Total Hip Arthroplasty?
Pascual Dutton, MD, The Taylor Collaboration, San Francisco, CA

8:17am – 8:25am — Discussion

Concurrent PA Session 4 *(Bay Room 6)*

Moderator: Kristi K. Posey, PA-C, ATC-LAT, *MD Anderson Cancer Center, Houston, TX*

7:30am – 7:55am — Arthroscopy: Early Wide Implementation in America
Robert E. Eilert, MD, Childrens Hospital, Denver, CO

7:55am – 8:20am — Hip Arthroscopy
Dean K. Matsuda, MD, DISC Sports and Spine Center, Marina Del Rey, CA

8:20am – 8:25am — Discussion

General Session 11 — Nights And Weekends: What to Expect On Pediatric Orthopaedic Call At Trauma Centers / How To Stay Out Of Trouble

Moderator: Francois Lalonde, MD, *University of California, Irvine Medical Center, Orange, CA*

8:25am – 8:55am — Case Presentations
John S. Vorhies, MD, Stanford Hospital and Clinics, Stanford, CA
John Schlechter, DO, Western University of Health Sciences College of Osteopathic Medicine of the Pacific, Pomona, CA

8:55am – 9:20am — **Break — Please visit Exhibits** *(Bay Rooms 2-3)*

Symposium 5 — Practice Management Symposium *"Bad to the Bone" – George Thorogood (1982)*

Moderator: David D. Teuscher, MD, *Beaumont Bone and Joint Institute, Beaumont, TX*

9:20am – 9:40am — The Biggest Liability Risks Facing Orthopedic Surgeons, and How to Avoid Them
Brian S. Kern, Esq., Arthur J. Gallagher & Co., Short Hills, NJ

9:40am – 9:55am — Social & Economic Value of Orthopaedic Surgery
John R. Tongue, MD, Tualatin, OR

9:55am – 10:10am — How to Build a Successful Practice
Jeffrey M. Smith, MD, San Diego, CA

10:10am – 10:30am — **Women in Orthopaedics**
How Far We Have Come?
Lisa Cannada, MD, St. Louis University School of Medicine, St. Louis, MO
Pregnancy and Maternity Leave in Orthopaedic Surgery
Jessica Ryu, MD, Stanford, Palo Alto, CA

10:30am – 10:40am — Discussion

General Session 12 — AAOS, BOC and Presidential Guest Speaker

Moderator: Paul C. Collins, MD, *Boise, ID*

10:40am – 10: 50am — AAOS Report
David D. Teuscher, MD, President, American Academy of Orthopaedic Surgeons, Beaumont Bone and Joint Institution, Beaumont, TX

10:50am – 11:00am — BOC Report
Robert R. Slater Jr., MD, Folsom, CA

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

Saturday, August 1, 2015

Disclosure Information is listed on pages 35-41.

11:00am – 11:30am ***Presidential Guest Speaker***
The View From 30,000 Feet
Douglas W. Jackson, MD, Long Beach, CA

11:30am – 11:40am **Refreshment Break** *(Foyer)*

Symposium 6 — Sports Medicine / Upper Extremity
"Hurts So Good" – John Cougar Mellencamp (1982)

Moderator: Mark J. Lemos, MD, *Lahey Medical Center, Peabody, MD*

11:40am – 11:55am Top 10 Sports Papers at AAOS
Dean K. Matsuda, MD, DISC Sports and Spine Center, Marina Del Rey, CA

11:55am – 12:10pm Late Treatment of Missed Wrist Injuries
Giles W. Becker, MA, MB, BChir, FRCS (Tr and Orth), University of Arizona, Tucson, AZ

12:10pm – 12:25pm Biceps Ruptures
Douglas T. Hutchinson, MD, University of Utah Health Care, Salt Lake City, UT

12:25pm – 12:40pm Knee Dislocations
Sara L. Edwards, MD, Sports Orthopaedic and Rehabilitation Medicine, Redwood City, CA

12:40pm – 12:50pm Discussion

12:50pm – 12:55pm **Go to Rapid Fire Stations**

Rapid Fire Session 13A — Orthopaedic Imaging *(Foyer)*

Moderator: Major Seth McCord, MD, *USAF, Anchorage, AK*

12:55pm – 12:59pm The Sourcil Sector Angle: New Radiographic Sign of Acetabular Dysplasia
Stephanie Pun, MD, Stanford School of Medicine, Redwood City, CA

12:59pm – 1:03pm ACL Tear and Posterior Inferior Tibial Slope: Age, Gender, Race
Alana L. Waiwaiole, BS, David Geffen School of Medicine at University of California at Los Angeles, Los Angeles, CA

1:03pm – 1:07pm Evaluating Pediatric Patellar Instability Using TT-PCL Distance
Blake C. Clifton, MD, University of New Mexico School of Medicine, Albuquerque, NM
**Presented by Michael Decker, MD*

1:07pm – 1:10pm Discussion

1:10pm – 1:14pm Utility of Three-Dimensional Computed Tomography for the Surgical Management of Rib Fractures
Benjamin R. Pulley, MD, Mount Carmel West Hospital/Grant Medical Center, Columbus, OH

1:14pm – 1:18pm Why MRI Misses and How Might We Improve MR Interpretation?
John C. McConnell, MD, McConnell Orthopedic Clinic, Greenville, TX

1:18pm – 1:22pm Acute Versus Delayed MRI Imaging and Associated Pathology in Traumatic Shoulder Dislocations
Xinning Li, MD, Boston University School of Medicine, Boston, MA

1:22pm – 1:25pm Discussion

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

Saturday, August 1, 2015

Disclosure Information is listed on pages 35-41.

Rapid Fire Session 13B — Hand, Wrist & Elbow *(Foyer)*

Moderator: Deana Mercer, MD, *University of New Mexico School of Medicine, Albuquerque, NM*

12:55pm – 12:59pm — Factors Affecting Appropriateness of Transfers for Hand Injuries
Djuro Petkovic, MD, Loma Linda University, Loma Linda, CA

12:59pm – 1:03pm — Clinical Outcomes of Single-Incision Suture Anchor Repair of Distal Biceps Tendon Rupture
John P. Dupaix, MD, University of Hawaii, Honolulu, HI

1:03pm – 1:07pm — Partial Trapeziectoy with Capsular Interposition for Thunb CMC Arthritis
Moheb S. Moneim, MD, University of New Mexico School of Medicine, Albuquerque, NM

1:07pm – 1:10pm — Discussion

1:10pm – 1:14pm — Clinical Diagnosis of Coincident Carpal and Cubital Tunnel Syndromes
Justin Koh, MA, David Geffen School of Medicine at UCLA, Los Angeles, CA

1:14pm – 1:18pm — Outcomes After Distal Radius Fracture Treatment with Percutaneous Wire Versus Plate Fixation: A Meta-Analysis of Randomized Controlled Trials
Mark Anderson, MD, Loma Linda University Medical Center, Loma Linda, CA

1:18pm – 1:22pm — Computer Assisted Surgical Planning for Distal Radius Malunion: A Randomized Controlled Trial
Natalie L. Leong, MD, University of California at Los Angeles, Los Angeles, CA/Massachusetts General Hospital, Boston, MA/Kleinert Kutz Hand Center, Louisville, KY/Swedish Sahlgrenska University, Gothenburg, Sweden/Handgroep Groeninge, Kortrijk, Belgium

1:22pm – 1:25pm — Discussion

Rapid Fire Session 13C — Knee *(Foyer)*

Moderator: Jeffrey M. Nakano, MD, *Grand Junction, CO*

12:55pm – 12:59pm — Pre-Operative Patient Recorded Outcome Measures Predict Patient Discharge Location Following UKA
Alfonso E. Ayala, BS, University of Arizona, Tucson, AZ

12:59pm – 1:03pm — Are Custom Cutting Guides Better for Total Knee Arthroplasty Patients?
John Heydemann, MD, University of Texas Medical School at Houston, Houston, TX
**Presented by Gregory Catlett, MD*

1:03pm – 1:07pm — Dramatic Reduction in Blood Transfusions in THA and TKA Using Activecare + SFT and Tranexamic Acid *Joshua Campbell, MD, Cedars-Sinai, Los Angeles, CA*

1:07pm – 1:10pm — Discussion

1:10pm – 1:14pm — Modular Distal Femoral Endoprosthetic Replacement for Nontumour Limb Salvage
Cynthia M. Kelly, MD, Colorado Limb Consultants, Denver, CO

1:14pm – 1:18pm — Quadriceps Tendon Ruptures: Comparing Outcomes Between Suture Anchor and Bone Tunnel Repairs
Daniel M. Elkin, MD, Rutgers - New Jersey Medical School, Newark, NJ

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

Saturday, August 1, 2015

Disclosure Information is listed on pages 35-41.

1:18pm – 1:22pm — Comparison of Patella Fracture Fixation Methods Using Braided Cable Vs Monofilament Wire
Adam N. Wooldridge, MD, MPH, Texas Tech University Health Sciences Center, Lubbock, TX

1:22pm – 1:25pm — Discussion

Rapid Fire Session 13D — Trauma *(Foyer)*

Moderator: Keith A. Mayo, MD, *University of Washington Orthopaedics and Sports Medicine, Seattle, WA*

12:55pm – 12:59pm — Debridement of Open Tibia Fractures More Than 48 Hours After Injury: Does Time to Surgery Matter?
Nathanael Heckmann, MD, LA County - USC Medical Center, Los Angeles, CA

12:59pm – 1:03pm — Blade Plate Revisited: Treatment of High Energy Proximal Femur Fractures
Timothy S. Achor, MD, University of Texas Houston, Houston, TX

1:03pm – 1:07pm — Major Complications Following Use of the Reamer Irrigator Aspirator
F. Andrew Rowan, MD, MS, University of Arizona, Tucson, AZ

1:07pm – 1:10pm — Discussion

1:10pm – 1:14pm — Prophylactic Fixation of Contralateral Side Is Cost-Effective After Bisphosphonate-Associated Atypical Femur Fracture
Bonnie Yi-Jun Chien, BA, Stanford School of Medicine, Stanford, CA
**Presented by Julius A. Bishop, MD*

1:14pm – 1:18pm — Fluoroscopically-Guided Percutaneous Screw Fixation for Pelvis and Acetabular Trauma: Is It Safe?
James Learned, MD, Harborview Medical Center, Seattle, WA

1:18pm – 1:22pm — Acetabular Fracture Fixation Utilizing Kocher-Langenbeck Approach Without Specialty Traction Table
Patrick C. Schottel, MD, University of Texas Houston, Houston, TX
**Presented by Camden M. Tissue, MD*

1:22pm – 1:25pm — Discussion

1:25pm – 1:30pm — **Go to General Session Room**

Symposium 7 — Spine Symposium
"Let Your Backbone Slide" – Maestro Fresh Wes (1989)

Moderator: Dwight S. Tyndall, MD, *Indiana University School of Medicine, Munster, IN*

1:30pm – 1:41pm — The Good, the Bad & the Ugly of the Sacrum
Milton "Chip" Routt Jr., MD, University of Texas Health Science Center, Houston, TX

1:41pm – 1:52pm — Spine Surgery for Dummies: What Do All Those Acronyms Really Mean?
Michael R. Briseno, MD, Dallas, TX

1:52pm – 2:03pm — BMP-2 in Spinal Surgery: Controversies and Current Use
Mark J. Wang, MD, Scottsdale, AZ

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

Saturday, August 1, 2015

Disclosure Information is listed on pages 35-41.

2:03pm – 2:14pm Jack's Back: Failed Spine Surgery in the Life and Career of John. F. Kennedy
Robert A. Hart, MD, Oregon Health & Science University, Portland, OR

2:14pm – 2:20pm Discussion

2:20pm – 2:25pm **Adjourn**
The Final Countdown – Europe (1986)

2:25pm – 2:55pm **Show & Tell — Industry Presentation by THINK Surgical**
(Foyer)
*CME Credit Not Available

2:55pm – 3:25pm **Scientific Poster Session**
(Bay Room 1)
Note: Presenters will be available to answer questions.

3:25pm – 4:25pm **Multimedia Education Session**
(North Cape Bay Room)

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

2015 WOA Presenters and Moderators

2015 Scientific Program Abstracts — Thursday

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

Thursday, July 30, 2015

General Session 2 — Orthopaedic Practice Patterns and National Trends: Part 1

Moderator: Thomas J. Christensen, MD

8:20am – 8:26am

Preferences and Trends for Elective Surgery on Nicotine Users Amongst Orthopaedic Surgeons

Matt Lilley, MD
Michael T. Krosin, MD

Introduction: In Orthopaedic literature there exists a lack of studies investigating how surgeons alter their management of patients who use nicotine. Though research has confirmed the detrimental effects of tobacco use on wound and fracture healing, and the elevated risk of infection post-operatively little has been done to show how this has affected the way Orthopaedic surgeons manage their nicotine-using operative patients. We conducted a survey of current operating Orthopaedists and literature review of peer reviewed orthopedic journals. Our objective was to understand how nicotine use influences Orthopaedic surgeons in their pre and post-operative management in elective surgery.

Methods: On Specialty Day, at the 2012 annual meeting of the American Academy of Orthopaedic Surgeons a nine question paper survey was evenly distributedamongst Orthopaedic surgeons including specialty trained Spine, Trauma, Foot & Ankle and Hip/Joint Reconstruction, along with General Orthopaedists. The survey asked questions regarding surgeon attitudes and practice management in respect to nicotine-using patients.

Results: Forty-two percent of all respondents never delay elective surgery due to a patient's nicotine use followed closely by less than 3 months delay. Approximately half of all respondents spend less than 5 minutes counseling tobacco users pre-operatively regarding the increased risk of nicotine use on post-operative outcomes. Approximately half of all respondents discouraged but did not explicitly prevent smokers from leaving their room to smoke post-operatively while in the hospital.

Discussion and Conclusion: Subspecialty had little bearing on how Orthopaedic surgeons manage nicotine users given the minimal variation in responses between each Sub-Specialty group. Nicotine use affects how the majority of Orthopaedic surgeons manage elective surgical patients who are users. The alteration of management is rarely substantial. Further studies should determine why surgeons rarely make significant alterations in their management of nicotine users and what modifications in practice can improve outcomes of these patients.

Notes:

8:26am – 8:32am

Treatment Trends and Complication Rates Following Humeral Shaft Fractures

Claire D. Eliasberg, BA
Chad R. Ishmael, MD
Jeremiah R. Cohen, BS
Jeffrey C. Wang, MD
Frank A. Petrigliano, MD

Introduction: Controversy exists regarding the preferred treatment modality for humeral shaft fractures (HSFs). Many surgeons elect to treat HSFs non-operatively as anatomic reduction may be unnecessary to obtain satisfactory clinical outcomes. However, closed treatment of HSFs may lead to increased rates of subsequent surgeries.

Methods: A national private insurance database was queried from 2007 to 2011 for patients with HSFs who underwent closed reduction, open reduction and internal fixation (ORIF), or intramedullary nailing (IM nail). Patient age, gender, and geographical region were recorded. Patients were followed for subsequent codes linked to operative procedures (within 1 year), hardware removal (within 2 years), and infection (within 30 days).

Results: From 2007 to 2011, 6719 patients underwent HSF treatment. Overall, there was a higher proportion of patients undergoing closed reduction than operative procedures (60.8% vs. 39.2%) and a higher proportion of patients undergoing ORIF than IM nail (63.2% vs. 36.8%). The Northeast had the highest rates of both closed procedures versus open procedures and ORIF versus IM nail, while the South had the lowest. Patients requiring subsequent surgery were more common following closed treatment compared to open (10.7% vs. 6.4%). There was no difference in the overall rates of subsequent surgery following ORIF and IM nail; however, hardware removal was more common following IM nail than ORIF (15.4% vs. 11.4%). There was no difference in infection rates following IM nail versus ORIF.

Discussion and Conclusion: Our results comprise the largest known study of HSFs and demonstrate that there was a consistent preference for closed reduction over open treatment and ORIF over IM nail throughout the United States. Subsequent surgery rates were higher following closed reduction, and hardware removal was more common following IM nail.

Notes:

8:32am – 8:38am

Pediatric Supracondylar Humerus Fractures: Does After-Hours Treatment Influence Outcomes?

Gabrielle M. Paci, MD
Kali Tileston, MD
Julius A. Bishop, MD

Introduction: Pediatric supracondylar humerus fractures are common and, when displaced, require surgical reduction and fixation. Surgery frequently occurs outside of normal operating hours. This may be suboptimal due to factors such as surgeon fatigue, limited hospital resources, and variation in surgeon comfort with pediatric fracture care. This study compared the outcomes of pediatric supracondylar humerus fractures treated during daytime operating room hours to those treated after-hours.

Methods: Fifty-six pediatric patients treated with surgical reduction and pinning of closed supracondylar fractures were retrospectively reviewed. Patients were divided into two groups. Daytime hours were defined as a surgery start between 06:00 and 15:59 on weekdays. After-hours included surgery start between 16:00 and 05:59 on weekdays or any surgery on weekends. Demographics, surgeon subspecialty, operative time, complications, and clinical outcomes were extracted from the patient medical records. Radiographs were assessed for injury classification and quality of reduction. Statistical analysis was performed using chi-square, Fisher exact test, and the Student t-test.

Results: There were no significant differences in demographics between the daytime hours and after-hours patient groups. Surgery performed during daytime hours was more likely to be performed by a pediatric orthopaedic surgeon than after-hours surgery. Fractures treated with after-hours surgery were more likely to be completely displaced, classified as Gartland Type III. There were no significant differences between groups in terms of operative time, complications, range of motion or radiographic alignment at final follow-up.

Discussion and Conclusion: Surgical treatment of pediatric supracondylar humerus fractures performed outside of normal operating room hours has similar operative times and outcomes as surgery performed during daytime hours, despite a lower likelihood of being performed by a fellowship-trained pediatric orthopaedic surgeon and a higher frequency of more severe fracture patterns. This data can better inform surgeons who must decide how and when to treat these fractures.

Notes:

8:38am – 8:44am

Open Shoulder Stabilization: Current Trends and Post-Operative Complications

Adam Z. Khan, BS
Tomasz J. Kowalski, MD, PhD
Jeremiah R. Cohen, BS
Chad R. Ishmael, BS
David R. McAllister, MD
Jeffrey C. Wang, MD
Frank A. Petrigliano, MD

Objective: Shoulder instability is a common orthopaedic problem spanning an extensive patient demographic with an estimated incidence of 23 out of 100,000. Despite the increased utilization of open autograft and allograft bone grafting for shoulder stabilization, we are unaware of any study that has examined the recent trends and complications following open bone transfer stabilization procedures. The purpose of this study was to investigate the current trends in open shoulder stabilization—open Bankart repair, coracoid process transfer, anterior bone block, posterior bone block—and identify the major post-operative complications following these procedures.

Methods: A national database of insurance billing records of orthopaedic patients was used to identify individuals undergoing open shoulder stabilization between 2007 and 2010. CPT codes for open Bankart repair [23455], coracoid transfer [23462], anterior bone block [23460], and posterior bone block [23465] were utilized to track major procedural trends. For each of the 4 procedures, complications were tracked for a 12 month post-operative period and categorized into 5 groups: dislocation with closed treatment, closed manipulation under anesthesia, reoperation with arthroscopy, reoperation with open surgery, and others (infection or arthroplasty). Data was stratified by age: 10 to 24, 25 to 54, and > 55. Linear regression analysis was utilized to assess significance (p 55 age group.

Results: By age the most common complications were: open reoperation in the 10 to 24 age group (3.4%), arthroscopic reoperation in the 25 to 54 age group (4.4%) and infection/arthroplasty in the > 55 age group (12.4%), with the vast majority consisting of shoulder arthroplasty.

Conclusions: The current data suggests a decline in the use of open Bankart repairs over the study period. The utilization of bone transfer procedures did not change significantly over the study period. The use of a bone transfer procedure was correlated with significantly higher reoperation rate than Bankart repair, particularly in the older patient cohort. Further studies are required to compare reoperation rates of open procedures to contemporary arthroscopic techniques.

Notes:

8:38am – 8:44am

Total Elbow Arthroplasty — Current Indications, Trends, and Controversies

Thomas J. Christensen, MD

Indications, Trends, and Controversies

Notes:

Thursday, July 30, 2015

Rapid Fire Session 3A — Basic Science

Moderator: Langdon A. Hartsock, MD

9:05am – 9:09am

Hypoxic Culture Conditions Induce Increased Metabolic Rate and Collagen Gene Expression in ACL-Derived Cells

Natalie L. Leong, MD
Tomasz J. Kowalski, MD, PhD
Ling Wu, PhD
Nima Kabir, MD
Denis Evseenko, MD, PhD
David R. McAllister, MD
Frank A. Petrigliano, MD

Introduction: Anterior cruciate ligament (ACL) rupture is a common surgical problem, with a need for alternative graft sources. In tissue engineering, finding an ideal cell source

for regenerating the ACL would be beneficial. In the current study, we systematically characterize three novel ACL-derived cell populations with the potential for ligament regeneration: ligament-forming fibroblasts (LFF, CD34- CD44+CD146-), ligament perivascular cells (LPC, CD34-CD44+CD146+), and ligament interstitial cells (LIC, CD 34+ CD44+CD146-), and describe their proliferative and differentiation potential, collagen gene expression and metabolism in both normoxic and hypoxic environments, and their trophic potential in vitro.

Methods: Remnant ACL tissue was harvested from 10 patients undergoing ACL reconstruction. The tissue was then digested, and fluorescence-activated cell sorting was used to isolate three cell populations (LFF, LPC, LIC). These cells were then cultured in both normoxic and hypoxic conditions, and proliferative rate, pluripotent activity, and trophic activity were assessed.

Results: All three groups of cells isolated from adult human ACL exhibited progenitor cell characteristics with regards to proliferation and differentiation potential in vitro. Culture in low oxygen tension enhanced the collagen I and III gene expression in LICs and LFFs and increased oxygen consumption rate and extracellular acidification rate in LICs, LFFs, LPCs as compared to normal oxygen concentration**.**

Discussion and Conclusion: In summary, this study demonstrates for the first time the presence of three novel progenitor cell populations in the adult ACL that demonstrate robust proliferative and matrix synthetic capacity; these cells may play a role in local ligament regeneration, and consequently represent a potential cell source for ligament engineering applications. Additionally, the finding of both increased aerobic and anaerobic metabolism of these cells in hypoxic culture has implications on the optimal conditions for culture of these cells in vitro for ligament tissue engineering.

Notes:

9:09am – 9:13am

Biomechanical Comparison of Placement Density with an All Suture and Traditional Anchors

John Rodriguez, MD
Ephraim Dickinson, MD
Bruce I. M. Condez, BS
Jeremi Leasure, MS
William Montgomery, MD

Introduction: Arthroscopic repair techniques using suture anchors are well described, and commonly practiced to restore stability. However, there still remains a lack of information on optimum inter-anchor distance and anchor density for these devices. New all suture anchors have the possibility of being implanted in a denser configuration than traditional screw-in type anchors and have become popular due to ease of use and ability to place on very narrow surfaces such as the glenoid rim. Our goal is to investigate the relationship between anchor placement density and mechanical performance for two common anchor systems.

Methods: Fresh-frozen porcine femurs were obtained from a tissue bank and implanted with either large screw-in anchors, deployed in a triangle configuration of low density (minimal inter-anchor distance), or all-suture anchors deployed in a triangle of equal size at double the density. Radiographs were captured to quantify the area of the footprint preserved after deployment and before specimens underwent single cycle pullout testing. The outcomes measured were ultimate strength, yield strength, stiffness, and footprint preservation. Differences between mean outcome measurements were analyzed between the two anchor systems with a repeat-measures ANOVA design with alpha 0.05.

Results: On average, the all-suture “high density” group had a statistically significantly larger ultimate strength of 1357 ± 210 N. The “low density” screw-in anchor group had a significantly smaller preservation area of 64.3 % ±4.1 %.

Conclusions: The “high density” configurations outperform larger screw-in anchors in traditional “low density” configurations. Our data supports the use of small all-suture anchors in “high density” configurations. Additionally, using smaller anchors preserves more surface area for soft tissue to bone healing.

Notes:

9:13am – 9:17am

Optimizing Compression: Comparing Eccentric Plate Holes and External Tensioning Device

Justin F. Lucas, MD
Mark A. Lee, MD
Jonathan G. Eastman, MD

Introduction: Osteosynthesis using plates to impart compression across a fracture and promote primary bone healing through anatomic reduction and absolute stability has been well described as a reliable and successful method to treat simple transverse and short oblique diaphyseal morphologies. Compression can be obtained through various techniques such as the dynamic compression design of plates with eccentric hole designs, either alone or in tandem with external compression techniques to apply additional load across a fracture, ultimately eliminating interfragmentary motion. This study utilized a simple transverse diaphyseal fracture model in a high quality composite bone model and standard dynamic compression plates (LCP) in conjunction with an articulated clamp (verbrugge) or articulated tensioning device (ATD) to investigate the amount of compression that can be achieved and maintained with each method. We hypothesize that dynamic compression plating augmented by external compression techniques would produce and maintain a significantly greater amount of compression than using the plate alone.

Methods: Simple transverse diayphyseal fractures were simulated in nine 4th generation composite bone models. A load cell was then placed within the transverse fracture osteotomy and stabilized and compressed using either eccentric screw placement in a dynamic compression plate alone, compressed with unilateral plate anchorage and an opposite segment verbrugge clamp application compressing using a screw outside the plate, or compressed with unilateral plate anchorage and an opposite segment articulated tensioning device application compressing using a screw outside the plate. Dynamic plate compression was also evaluated in conjunction with the external compression techniques. The initial compressive load across the fracture site was measured with the compressive instruments in place prior to screw placement, after screw placement with compressive instruments still in place, and after screw placement with removal of compressive instruments. A typical dynamic plate compression technique was used with the LCP plate, utilizing two screws for each sample, with measurements taken after placement of each individual screw. Statistical analyses were carried out using a linear mixed effects model and pairwise comparisons between conditions with a significance set at a P value less than 0.05.

Results: Average values for compressive load are displayed in figure 1. Both the external compression techniques (verbrugge and ATD) achieved significantly higher compression than the plate compression technique alone with 78% and 134% more compression respectively. The measured compression across the osteotomy after screw application and removal of external compression decreases by 17% for the verbrugge device and by 22%, after removal of the ATD device. For both techniques, adding additional screws in eccentric (load) position increases compression. For the verbrugge technique, compression increases 128% over clamp alone with the addition of one screw and 186% over clamp alone with the addition of two screws. For the ATD technique, compression increases 22% with the addition of one screw and increases 44% with the addition of two screws.

Conclusion: Plate compression is a reliable method for inducing compression across transverse and short oblique fractures. Augmenting plate compression technique with external compression techniques (verbrugge clamp or ATD) allow for a much greater compressive load to be achieved. Although the magnitude of absolute compression is greater with the combined plate compression and external compression techniques, there is a significant amount of compression lost after removal of the external compression device indicating that the maximal compression attainable across a fracture may not be reliably maintained. Further investigation into the factors that influence maintenance of compression in addition to the clinical impact on overall healing and outcomes of extreme compressive loads are warranted.

Notes:

9:25am – 9:29am

Locking Plates Stability: A Biomechanical Effect of Variable Cortical Contact

Zackary D. Vaughn, MD
Payam Tabrizi, MD
Noah Epstein, MD
Derek Lindsey

Introduction: The internal fixation of long bone fractures with locking plates for enhanced biological preservation with stable methods of osteosynthesis continues to grow in popularity. However, this protection of soft tissues and periosteum may lead to variability in plate to bone contact. This study was designed to evaluate if a reasonable amount of soft tissue space between the locked plate and the cortical surface would generate a significant decrease in the stability of these constructs.

Methods: 11 matched pairs of cadaveric femurs were osteotomized in the midshaft and translated 5 mm to simulate bone gaps in a comminuted fracture pattern. These were then stabilized with 4.5 stainless steel locking plates in identical configurations bridging the osteotomy site. One of each pair was treated with either a plate with standard direct cortical contact or with a 5 mm distance off the cortex. These constructs were then stabilized in PMMA and submitted to axial compression to assess load at failure and mode of failure.

Results: Direct contact fixation constructs failed at an average of 764N compared to 750N for the 5mm distance group. This difference was not statistically significant.

Discussion and Conclusions: The use of locking plates for long bone fractures can provide reliable stability and function as an internal fixator. Axial load resistance and overall stability is not diminished with an acceptable 5mm distance between the plate and the cortical surface while protecting the biological healing mechanisms of the bone, or attempting fixation of complex fractures. Locking plates are used more frequently with an expanding list of indications. This study proves the core principle of locking plates as functional internal fixators, and as fixed angle devices. These constructs can be safely utilized in fixation of long bone fractures with various techniques that may require variable contact with the cortical surface without sacrificing stability.

Notes:

9:29am – 9:33am

Fracture Healing in a Mouse Model Exposed to Peylated-NELL

Elizabeth L. Lord, MD
Justine Tanjaya, DDS
Jin Hee Kwak, DDS
Eric Chen, BA
Jeffrey C. Wang, MD
Chia Soo, MD
Kang Ting, PhD, DMed

Introduction: NEL-like molecule-1 (NELL-1) is a potent pro-osteogenic cytokine that has been demonstrated to enhance bone formation when applied locally. PEGylation is a process in which polyethylene glycol (PEG) is attached to a protein to prolong its half-life. The primary objective of this study is to investigate the effects of systemic administration of PEG-NELL-1 on fracture repair in a mouse fracture model; the secondary objective is to investigate effects on bone mineral density in uninjured bones.

Methods: Twelve CD-1 mice were subjected to 0.15mm transverse open osteotomies of the bilateral radii. They were treated with weekly tail vein injections of PEG-NELL-1 (n=5) or PEG phosphate buffered saline (PBS) (n=7). Animals were sacrificed at week 4. Fracture healing was evaluated by micro-CT and microPET. For microPET, F-18 is substituted for hydroxyl groups and binds to new bone; therefore uptake is higher in newly formed bone. Bone density was evaluated by Dual-energy X-ray absorptiometry (DXA) and performed on humeri and femurs.

Results: At 4 weeks of treatment, bone volume of the fracture site in the PEG-NELL-1 group was 22% greater compared with control across three different thresholds. There were no significant differences in trabecular density. MicroPET demonstrated 34% more uptake of F-18 in the PEG-NELL-1 group compared with control. On DXA, the PEG-NELL-1 group demonstrated significantly higher BMD than control in the mid and distal femur, proximal and distal humerus.

Conclusion: Weekly systemic administration of PEG-NELL-1 increased bone formation in this fracture model as verified by bone volume on micro-CT and F18 uptake on microPET. Furthermore, systemically injected PEG-NELL-1 induced bone formation as measured by DXA in uninjured long bones in mice. This discovery is novel as the first demonstration of a systemically administered anabolic cytokine

to enhance bone formation in fractured and uninjured long bones.

Notes:

9:33am – 9:37am

Reamed Femoral Intramedullary Nail Affects Trauma Induced Coagulopathy Based on Thromboelastography

Prism Schneider, MD, PhD, FRCS(C)
B. A. Cotton, MD, MPH
Andrew M. Choo, MD
Timothy S. Achor, MD
J. W. Munz, MD
M. L. Prasarn, MD
Joshua L. Gary, MD

Introduction: Reamed intramedullary nails (rIMN) are standard of care for femur fractures. However, reaming stimulates the immune system and controversy exists regarding timing of rIMN in polytraumatized patients. Rapid thrombelastography (rTEG) can guide resuscitation and is predictive of venous thromboembolic events (VTE). We hypothesized that rIMN will not significantly change rTEG maximalamplitude (mA) values after reaming.

Methods: Prospective cohort study of patients with femur fractures treated with rIMN or reamed cephalomedullary nail (rCMN). r-TEG was measured at hospital arrival (arrival r-TEG), 1-hour pre-femoral reaming (pre r-TEG), 1-hour post-reaming (post r-TEG), and 24-hours post-reaming (24-post r-TEG). The primary outcome measure is post-operative r-TEG. Statistical comparisons used the Wilcoxon rank-sum test.

Results: Nineteen patients (average age of 40.8 (SD = 19.2) years), with an average Injury Severity Score (ISS) of 15.6 (SD = 8.1). Seven patients presented with hypovolemic shock. Fifteen fractures were treated with rIMN, with a mean reaming time of 11.7 (SD = 6.3) minutes. 4 proximal fractures were treated with rCMN with a mean reaming time of 8.8 (SD = 7.6) minutes. Mean arrival r-TEG mA was 64.7 (SD = 4.9) compared with post r-TEG of 65.4 (SD = 4.8), and 24-post r-TEG of 68.1 (SD = 5.1). When arrival and 24-post r-TEG were compared, statistical significance was approached (p = 0.052). There were no in-hospital VTE, however five patients had clinical suspicion for a VTE. Four patients required blood transfusions.

Discussion and Conclusion: In this small prospective cohort, there was an increase from arrival r-TEG to 24-hour post-reaming for mA, indicating increased coagulopathy. r-TEG may be useful for understanding trauma patient coagulation profiles and inflammatory response to reaming. Pre-operative metabolic and coagulopathy normalization is important; therefore these results may help direct pre-operative resuscitation, in order to reduce the post-operative systemic inflammation, coagulopathy, and VTE.

Notes:

Thursday, July 30, 2015

Rapid Fire Session 3B — Hip

Moderator: Howard A. Chansky, MD

9:05am – 9: 09am

Accuracy of Ultrasound-Guided Intra-Articular Hip Injections Performed in the Orthopaedic Clinic

Eric K. Turner, MD
Todd Balog, MD
MAJ (Ret) John Slevin, PA
Laura Lewis, PA
LTC Lisbeth Bush, MD
LTC (P) Bryant G. Marchant, MD

Introduction: The purpose of this study is to determine the accuracy of intra-articular hip injections performed in the clinic utilizing ultrasound guidance.

Methods: A prospective study was performed of all patients indicated by orthopaedic providers for a diagnostic or therapeutic intra-articular hip injection. Omnipaque was added to the injection and they were performed under live ultrasound guidance utilizing a standard anterior technique. Patients were then transported immediately to radiology for confirmation with an AP pelvis radiograph. Patient diagnosis, BMI, proce-

dural time, and a visual analog scale score were recorded for each patient. Post-injection radiographs were reviewed for accuracy. RVU analysis was performed.

Results: Forty-three consecutive patients were identified. Seven patients underwent bilateral injections for a total of 50 hips. There were twenty-five male and eighteen female. The average BMI was 29.9. Pre-injection diagnosis included osteoarthritis, femoralacetabular impingement, labral tear, and hip pain of unknown origin. There was no identifiable omnipaque for two patients. 48 patients were left for analysis, 46 were confirmed intra-articular for an accuracy of 96%. The average procedural time was 2.6 minutes and the average VAS score was 1.9. Unilateral injections captured 3.61 RVUs.

Discussion and Conclusion: Hip injections are a valuable tool for clinical decision making. They have both therapeutic and diagnostic utility. Anatomic-based hip injection techniques raise concerns for both accuracy and safety. Therefore, most patients are either referred to radiology or taken to the operating room by the surgeon for a fluoroscopic guided injection. This approach involves another department, utilizes valuable operating room time, involves ionizing radiation, and/or leads to a loss of revenue for the orthopaedic clinic. As shown in this study, ultrasound guided hip injections performed in the clinic are accurate, efficient and well tolerated. Visualization of the neurovascular structures increases safety. Lastly, this generates revenue while preserving valuable OR time.

Notes:

9:09am – 9:13am

Subcutaneous Hip Fat Distribution in Relation to THA Surgical Approach

Gregory Sprowls, BS
Jessica Pruszynski, PhD
Bryce Allen, MD

Introduction: Although preoperative risk assessment is multifactorial, subcutaneous fat thickness at the incision site has been associated with postoperative complications in studies of total hip arthroplasty (THA) and numerous other surgical procedures. This study aimed to compare the thickness of subcutaneous fat that would be encountered with common lateral and anterior approaches to THA, and to examine the relationship between BMI and the distribution of subcutaneous fat around the hip based on sex and age.

Methods: We obtained subcutaneous fat measurements from 2,004 patient CT images at positions that correspond with the incision sites for lateral and anterior approaches to THA. A thickness ratio (lateral / anterior) was calculated for each patient. BMI, sex, and age were collected in a retrospective chart review.

Results: Males and females had significantly different thickness ratio averages, at 1.97 and 2.68 respectively. There was no significant difference in thickness ratios between BMI groups. Males and females had significantly different lateral thickness averages, and the interaction between sex and BMI group was significant. The relationship between BMI and the thickness ratio in males 65 years or older was significantly different from males younger than 65 and females of all ages. When comparing men and women, there was no difference in the relationship of BMI and any thickness variable.

Discussion and Conclusions: Regardless of BMI, sex, or age more soft tissue was measured at the incision site for an approach using a lateral hip incision than in one with an anterior hip incision. This predominance of lateral hip fat was more pronounced in females of all ages and BMI groups, and less pronounced in obese males 65 years and older. There was a positive relationship between BMI and both measurements with a similar rate of increase between males and females of all BMI groups.

Notes:

9:13am – 9:17am

Perioperative Outcomes of Total Hip Arthroplasy After Lumbar Spinal Fusion

Jeffrey J. Barry, MD
David Sing, BS
Thomas P. Vail, MD
Erik N. Hansen, MD

Introduction: The coexistence of degenerative hip disease and spinal stenosis, coined “hip-spine syndrome” by Fogel,

is a recognized entity that may be as prevalent as 18% in patients ultimately undergoing total hip arthroplasty (THA). The limited research to date suggests these patients experience less pain relief and worse outcomes compared to other THA patients. We hypothesize that primary THA patients who have undergone prior lumbar spinal fusion (LSF) experience worse perioperative outcomes.

Methods: Retrospective case-control study. All primary THA patients who had undergone prior LSF at our institution were identified and matched to a control group of primary THA patients who had not undergone LSF (1:2) based on age, sex, and American Society of Anesthesiologists (ASA) score. Perioperative outcomes were compared including complications, readmissions or reoperations within 90 days, anesthesia type, pain scores, narcotic usage, hospital length of stay, disposition, and walking distance.

Results: From 2012-2014, 35 THA patients had prior LSF (16 3 levels, 1 unknown). Compared to 70 matched controls, patients were similar in age, sex, ASA score, BMI and Charlson comorbidity scores. Prior LSF patients had statistically significant higher rates of complications (34.2% vs 12.9%), reoperation (14.3% vs 3.2%), readmission (17.1% vs 3.2%), general anesthesia (54.3% vs 5.7%), higher early pain scores, and increased post-operative narcotic usage. Post-operative walking distance, hospital length of stay, and disposition were not significantly different but trended to favor the patients without prior LSF.

Discussion and Conclusion: Preexisting LSF results in worse perioperative outcomes after primary THA including higher rates of complications and reoperation. Decreased functional mobility, decreased rates of neuraxial anesthesia, and higher narcotic usage likely all play roles in these findings. Hip-spine syndrome warrants attention in THA patients and represents an area for further investigation.

Notes:

9:25am – 9:29am

Initial Stiffness of Fixation in Vancouver C Periprosthetic Fractures

D. Andrew Hulet, BS
*Sean Thayne Tagge
Casey Whale, BS
Michael J. Beebe, MD, BS
Erik N. Kubiak, MD

Introduction: With the recent advances is polyaxial locking technology, we sought to determine the stiffness of the gold standard in comparison to bicortical locked-screw fixation around the implant stem in a synthetic, osteoporotic, biomechanical model.

Methods: 20 synthetic osteoporotic femoral models were implanted with a non-collared, press-fit hip stem. After the stem was seated through impaction and cycling, a 5cm section of femoral diaphysis was removed 2cm distal to the hip stem to simulate a Vancouver C fracture with comminution. A femoral locking plate was applied with four bicortical, locked screws in the distal segment and 3mm spacers between the plate and bone to simulate soft tissue interposition. Specimens were divided into four groups based on proximal segment fixation: A) three locked bicortical screws anterior to the stem, B) three locked bicortical screws posterior to the stem, C) three alternating locked bicortical screws with two posterior and one anterior to the stem D) three unicortical locked screws with a femoral allograft strut held in place by two proximal and two distal circumferential cables. Each specimen was placed at 25 degrees of adduction in a mounting fixture under a uniaxial servo-hydraulic testing machine. A preload of 50N was applied followed by application of a 250N load at 50N per second. The process was repeated with the specimen at 10 degrees from the horizontal using a load of 50N at 10N per second to simulate torsion during standing. This process was repeated in triplicate for each specimen. Load was assessed using the uniaxial servo-hydraulic testing machine and medial cortical displacement was assessed using an optical tracking device.

Results: The highest axial stiffness was documented in group D, which was significantly higher than groups A-C ($p=0.0001$). The axial stiffness of groups B and C were not significantly different ($p=0.1197$), but both were significantly greater than group A (Group B: $p=0.0227$; Group C $p=0.0014$). The highest torsional stiffness was also documented in group D, which was significantly higher than

groups A-C (p=0.001). The torsional stiffness of group C was also significantly higher than both group A (p=0.0208) and group B (p=0.0003).

Discussion and Conclusion: In patients with highly comminuted Vancouver C femoral shaft fractures, use of the traditional allograft strut and unicortical locked plate fixation still provides greater initial stability when compared to newer polyaxial locked plate fixation. If locked plate fixation is used, placement of bicortical screws both anterior and posterior to the stem should be utilized to provide maximum torsional and axial stiffness.

Notes:

9:29am – 9:33am

Acetabular Revision Using a Cementless Protrusio Shell: Radiographic Analysis and Survivorship at Mid-Term Follow-Up

Chase Bennett, MD
Derek F. Amanatullah, MD, PhD
William L. Bargar
Thomas Blumenfeld

Introduction: Loss of bone stock is a common finding in revision acetabular surgery. In comparison to hemispherical components, protrusio shells have a lateral cylindrical extension that may be useful in restoring joint center and improving initial stability. However, there is limited clinical data on these designs. The purpose of this study is to evaluate implant survivorship and the ability to restore the joint center using a specific deep profile acetabular shell.

Methods: We identified 55 patients who underwent revision acetabular surgery using a cementless protrusio shell that had a minimum of two years follow-up. The mean age at the time of revision was 63 ± 12.7 years-of-age. Final radiographs were taken at a mean of 6 ± 3.4 years post-operatively. The change in hip center was evaluated based on the difference between pre-operative and final post-operative radiographs. The final postoperative hip center was also compared to the contralateral native hip center when possible.

Results: Implant survivorship was 96% at 6 years mean follow-up. The pre- to post-operative change in hip center was 3.2 ± 7.4 mm laterally (ranging from 15.0 mm medial to 26.0 mm lateral), and 4.1 ± 7.5 mm inferiorly (ranging from 27.5 mm superior to 15.5 mm inferior). For the 21 patients who had a native contralateral hip, the mean change in the joint center when compared to the normal hip was 1.6 mm ± 5.9 laterally (ranging from 15.0 mm medial to 16.0 mm lateral) and 10.4 ± 6.2 mm superiorly (ranging from 0.5 mm superior to 22.0mm superior). Offset was within 3 mm of the native hip in 14 (66.7%) cases, 3 mm to 6 mm in 2 (9.5%) cases, and greater than 6 mm in 5 (23.8%) cases.

Discussion and Conclusion: At mid-term follow up radiographic survivorship of the cementless protrusio shell is excellent. Restoration of the joint center as compared to its pre-operative location as well as to the native contralateral hip is comparable to the literature on hemispherical shells with or without augments.

Notes:

9:33am – 9:37am

Outcome of Hip Fracture Care in Elderly Patients in a Senior Managed Care System

Hamed Yazdanshenas, MD
Elbey Washington III, MD

Introduction: There has been some debate in the orthopedic community as to whether the institution of a managed care model would affect the quality of care in the treatment of common orthopedic problems. We have undertaken a study to determine whether or not institution of a major managed care tool, a critical pathway affects the quality of care and efficiency in a group of senior patients with fractures of the hip.

Methods: We were able to compare equivalent populations of senior hip fracture patients both before and after institution of our critical care pathway in regards to specific markers of quality, i.e., mortality rate, complication rate, readmission rate, reoperation rate and length of stay. We were additionally able to prospectively follow and report on 102 randomly chosen patients' median age 80 years with hip fractures treated by us under our critical care path protocol. This study group allowed us to evaluate our quality of care as compared to previous information in regards to hip fracture type and treatment, mortality rate at one year, pre and post-op ambulatory status and pre and post-op living arrangement.

Results: Our study shows a 9% mortality rate at one year, a 95% return to pre fracture living arrangement and a 93% return toambulatory status. We found that this patient population compared favorably with that reported in the literature. In addition the quality of care given pre and post critical pathway was equivalent while the length of stay dropped 30%.

Discussion and Conclusion: We concluded that our hip fracture treatment protocol (critical care pathway) could be recommendable to improve the quality of care in senior patients with hip fractures.

Notes:

Thursday, July 30, 2015

Rapid Fire Session 3C — Pediatrics

Moderator: Walter F. Krengel III, MD

9:05am – 9:09am

Necessity of Postoperative Radiographs Prior to Pin Removal Following Surgical Treatment of Supracondylar Humerus Fractures

Michael J. Dempewolf, DO, MBA
John Schelchter, DO

Background: No study has examined the safety, utility, and efficacy of pin removal prior to radiographic examination during the postoperative care of surgically treated supracondylar humerus fractures in children. The purpose of this study was to determine the necessity of obtaining radiographs prior to the removal of pins placed during the operative treatment of supracondylar humerus fractures.

Methods: We performed a retrospective review of 532 children with operatively treated supracondylar humerus fractures at our institution from January 2007 through December 2012. These patients were then divided into two groups for comparison. Group 1 consisted of patients who had radiographs taken prior to pin removal on the date of intended removal. Group 2 consisted of patients whose radiographs were taken after their pins had been removed. Demographic data collected included age, sex, extremity involved, fracture type based on the modified Gartland classification, and type of post-operative immobilization. Data collected included Baumann's angle and lateral humeral capitellar angle at the time of surgery and final radiographic follow up, number of radiographs taken prior to pin removal, and if pins were ever retained after radiographs on the date of intended pin removal.

Results: There were no demographic differences between groups. No statistically significant change in Baumann's angle or lateral humeral capitellar angle was noted between the two groups. We noted no change in postoperative management between the two groups, and no patients in Group 1 had their pins retained after radiographs were taken on the date of intended pin removal.

Conclusion: It is safe and effective to discontinue immobilization and remove pins prior to obtaining radiographs with no significant change in radiographic alignment or clinical sequelae. Doing so can also aid in clinic flow and decrease the child's anxiety associated with having to have radiographs with exposed pins and multiple cast room procedures.

Notes:

9:09am – 9:13am

Revision Surgery Rates After Primary Fusion for Adolescent Idiopathic Scoliosis

Joseph H. Dannenbaum IV, MD
Bryan J. Tompkins, MD
William B. Bronson, MD
Paul M. Caskey, MD

Hypothesis/Purpose: The purpose of this study is to define the revision rates in Adolescent Idiopathic Scoliosis (AIS) at a single referral based pediatric center and compare various instrumentation constructs utilized during the initial spinal fusion.

Methods: A retrospective chart review was performed of all patients with AIS who underwent instrumented fusion from January 1990 through December 2011 with minimum of 2 year follow up. Demographic information, types of implants, surgical approach and other information concerning the primary surgery and all subsequent revision operations was obtained from the medical chart and operative logs. Exclusion criteria included age younger than 10 or older than 18, or diagnosis of congenital, infantile, or neuromuscular scoliosis, isolated kyphosis or primary surgical fusion performed at an outside facility.

Results: Four hundred and eleven patients who underwent instrumented fusion for AIS during the study period met our inclusion criteria. There were 333 posterior spinal fusions, 30 anterior only fusions, and 48 combined anterior and posterior fusions performed. The posterior spinal fusion constructs included 103 pedicle screw constructs, 27 hybrid hook and pedicle screw constructs, 200 all hook constructs and 3 wire only constructs. A total of 66 revision operations were performed in 50 patients (12.2%). Prominent hardware, pseudarthrosis, and infection were the most common indications for revision. Posterior pedicle screw constructs had a lower revision rate (5.8%) compared to the rest of the study population (p=0.02). The all hook, hybrid, anterior only and combined fusions had revision rates of 13.0%, 18.5%, 10.0% and 20.8% respectively which were not statistically different. Additionally, when specifically comparing pedicle screw and all hook constructs, there was a statistical difference in pseudarthrosis rates, favoring pedicle screw instrumentation with no difference in the rates of infection or prominent hardware (p=0.03)

Conclusions/Significance: Patients undergoing instrumented fusion for AIS are at some risk for requiring subsequent surgery after their initial procedure. To lessen that risk, pedicle screws constructs should be considered as they show an overall lower revision rate compared to other constructs specifically regarding the rate of pseudarthrosis compared with posterior hook only constructs.

Notes:

9:13am – 9:17am

Results of Early Hip Reconstructive Surgery in Severely Involved Children with Cerebral Palsy

Betsy K. Bean, DO
Glen Baird, MD
Bryan J. Tompkins, MD
William B. Bronson, MD
Mark McMulkin, PhD
Paul M. Caskey, MD

Introduction: Hip subluxation and dislocation are frequently encountered in patients with severe cerebral palsy. Controversy exists whether bony hip reconstructive procedures should be delayed until children are older to prevent recurrence. The purpose of this study was to evaluate the success of hip reconstructive surgery based on age and procedure.

Methods: We performed a retrospective review of children with cerebral palsy (GMFCS IV and V) who underwent hip reconstruction at a single institution from 1990 to 2010. Patients underwent proximal femoral varus derotational osteotomy (VDRO) alone or in combination with pelvic osteotomy (PO). Patients who had previously undergone soft tissue procedures were excluded. Minimum follow-up was 24 months. “Failure” was defined as migration index at final follow-up greater than 50% or subsequent hip reconstructive surgery.

Results: Included in the study were 157 hips in 87 patients. VDRO alone was performed on 82 hips and VDRO plus PO on 75. Surgery was performed on 73 hips in patients less than six years old (51 VDRO, 22 combined) and 84 hips in patients six or older. At follow-up (avg. 4.4 years), there were 26 hips that failed. Twenty-one failures had VDRO alone and sixteen of these were in patients younger than six. In this younger group, hips undergoing VDRO plus PO compared to VDRO alone had a statistically significant improvement in final migration index at 13.0% vs. 30.4% (p 0.0012). There were zero failures in the 22 hips undergoing VDRO plus PO in children younger than six. Linear regression analysis showed no relationship between age at surgery and correction of migration index from surgery to follow-up.

Conclusions: Hip reconstructive surgery in the severely involved patient with cerebral palsy may be considered as a definitive intervention at an early age. Best results are obtained when VDRO is performed in combination with pelvic osteotomy.

Notes:

9:25am – 9:29am

Severity of Asynchronous SCFE in Skeletally Immature Versus Mature Patients

Gregory Strohmeyer, MD
*Lisa Toelle, BS
Selina Silva, MD
Philip Nowicki, MD
Trevor Wahlquist, MD
Ying Li, MD
Frances Farley, MD

Introduction: To assess the slip severity of SCFE in skeletally immature versus mature patients to determine if contralateral hip prophylactic screw fixation is warranted.

Methods: Patients with two asynchronous SCFEs which were treated at three pediatric hospitals from 2002 to 2011 were retrospectively reviewed. Patients were divided into immature (Oxford grade 1) versus more mature (Oxford Grade 2/3) triradiate cartilage groups. Data evaluation included age, time between SCFE, BMI, Southwick angles at first and second SCFEs, and with follow-up duration.

Results: There were 45 patients total: 16 skeletally immature and 29 skeletally mature. Average age at first SCFE in immature patients was 10.9 years and mature patients 12.1 years. Age at second SCFE in immature patients was 11.5 years and mature patients 13.0 years. Mean age at SCFE was higher in the mature group, however was only statistically significant at the second slip (p=.023). Average time between SCFEs was 6.6 months for immature and 11.4 months for mature patients (p=.093). Southwick angles for immature patient first and second SCFEs were 25º and 12.9 º respectively. Southwick angles for mature patient first and second SCFEs were 31º and 21º. There was a statistically significant association between severity of first slip and second slip (p=.0089) in both groups, which outweighed any predictive value of skeletal maturity. Gender and BMI were not predicative of severity of slip.

Discussion and Conclusion: The second SCFE event was of lesser magnitude for both patient groups when compared to the first event, and was highly associated with the magnitude of the first event. Failure to prophylactically fix an unaffected hip did not lead to a worse second SCFE deformity for both patient groups. This is likely due to clinical diligence by surgeon and patient awareness to the high possibility of a second SCFE event to occur.

Notes:

9:29am – 9:33am

Success of Fixation of Pediatric Supracondylar Femur Fractures with Fracture Non-Specific Implants

Meghan Imrie, MD

Introduction: Fractures of the supracondylar region of the distal femur, especially those at the metadiapyhseal junction,

in older children and adolescents with open physes pose a treatment challenge – too proximal to percutaneously pin, too distal to flexible nail, too big to cast. Although pediatric fracture-specific implants do exist, they are not always readily available in the time frame often dictated by these traumatic injuries. Out of necessity, we began using 2 implants widely available that are not specifically designed for the distal femur but which, with minor contouring, fit remarkably well – a generic locking T plate and a distal medial tibial locking plate.

Methods: This was a retrospective review of all patients with a distal metaphyseal femur fracture treated with plate fixation at our institution from 2009 to present. Patients were excluded if they had insufficient follow-up or records. Charts were reviewed for demographics, complications if any, and clinical outcome. Radiographs were reviewed for healing and any malalignment or physeal injury.

Results: Nine patients were identified, but 2 had insufficient records. The remaining 7 patients had an average age of 11.5 years (range 9-14 years) and an average follow-up of 20 months (range 5-36 months). Four of the 7 were revisions; 1 for early failure of prior fixation, 1 for a non-union of a pathologic fracture through a large NOF, and 2 for definitive fixation following initial treatment with an external fixator. Four patients were treated with a locking T-plate and 3 patients were treated with a distal medial tibial locking plate; all patients healed well without longitudinal physeal arrest. Complications included 2 mild leg length discrepancies (less than 1 cm) that resolved by final follow-up and one patient who developed genu valgum that required guided growth 17 months after the initial procedure. That same patient developed chronic recurrent multifocal osteomyelitis (CRMO) 19 months after his index procedure. All patients had returned to their prior level of activity at final follow-up.

Conclusion: Distal metaphyseal femur fractures in older children and adolescents can be successfully treated with 2 readily available trauma implants not specifically designed for that purpose. This addition to the surgical armamentarium will aid in addressing these challenging fractures.

** The FDA has not cleared this drug and/or medical device for the use described in this presentation.* *(Refer to page 43.)*

Notes:

9:33am – 9:37am

Treatment Guidelines for Acute Pediatric Musculoskeletal Infections: Worth the Effort?

Murray D. Spruiell, MD
Jesse Roberts, MD
Erin Wylie, BA
Laura Pyle, PhD
Travis C. Heare, MD
Sarah Parker, MD

Introduction: This is a quality improvement project designed to evaluate the efficacy of implementation of a multidisciplinary clinical care guideline (CCG) for management of acute pediatric musculoskeletal infections regarding patient outcomes and utilization of hospital resources.

Methods: Retrospective chart review was performed to evaluate patients admitted to a large pediatric tertiary referral center diagnosed with acute osteomyelitis, septic arthritis, pyomyositis, and/or abscess before and after implementation of the guideline. Multiple measures were compared between the two cohorts including radiological, laboratory and treatment data, demographics, as well as resource utilization information. The Kruskal-Wallis test was used to compare continuous outcomes before and after the implementation of the new guidelines. The chi-square or Fisher's exact test was used to compare categorical outcomes, and the log-rank test was used for time to event outcomes.

Results: 82 patients were identified in the pre-implementation cohort (PRE) and compared with 82 patients in the post-implementation group (POST). When adjusted for severity of illness, all three primary outcomes (length of stay, length of IV antibiotic therapy, and days of IV antibiotic therapy) were statistically significantly different PRE vs. POST with a median reduction of 0.62, 4.89, and 6.4 days, respectively. Additionally, significant improvements were found for patients in the POST group regarding earlier time to first culture, more Infectious Diseases (ID) consultations, a 34.2% decrease in central venous catheters placed, a median reduction in time to afebrile by 24.5 hours, and a 50% decrease in the number of related readmissions.

Discussion and Conclusion: Implementing a CCG centered on identification of the causative pathogen and tailored antibiotic therapy resulted in significant improvements in multiple primary and secondary outcomes while decreasing exposure

to IV antibiotics. We anticipate this and similar studies will redefine the standard of care in the future.

Notes:

Thursday, July 30, 2015

Rapid Fire Session 3D — Sports (Knee)

Moderator: Omer Ilahi, MD

9:05am – 9:09am

Gender Differences in Knee Flexion Angle While Running

Christopher L. Sheu, MD
*David Brown, BS
Aaron M. Gray, BS
Brian A. Smith, MD

Introduction: We hypothesized that female athletes would have a lesser degree of knee flexion than male athletes at initial ground contact while performing change-of-direction cutting maneuvers.

Methods: Twenty female and 20 male high school soccer athletes with at least 1 year of experience were recruited. Athletes were excluded if they had a history of any major lower limb injury or current knee pain causing a reduction in training and/or competition. Reflective markers were attached at the greater trochanter of the femur, lateral epicondyle of the knee, and lateral malleolus of the ankle to enable motion capture. Each athlete performed six change-of-direction maneuvers in random order in front of two cameras. Multiple regression analysis was used to determine differences between the sexes from the motion data captured.

Results: Statistically significant differences existed in knee flexion angles between males and females at 90 and 135 degrees cutting angles. At 90 degrees, males and females showed average initial contact knee flexion angles of 39.0 ± 6.8 and 29.3 ± 6.2, respectively. At 135 degrees, males and females showed average initial contact knee flexion angles of 36.8 ± 7.9 and 29.7 ± 7.8. At 90 degrees, males and females showed average maximum flexion angles of 56.4 ± 6.9 and 49.7 ± 7.0. At 135 degrees, males and females showed average maximum flexion angles of 60.7 ± 8.1 and 51.6 ± 9.4.

Discussion and Conclusion: The research conducted is intended to foster an awareness of injury disposition in female athletes. This project is innovative as wider side-cut maneuvers (greater than or equal to 90 degrees) were studied, as compared with previous studies using small side-cut angles (less than 90 degrees), offering a model for alternative sports actions.

Notes:

9:09am – 9:13am

Predictors of Orthopaedic Surgery in NCAA Athletes

Dean Wang, MD
*Caitlin M. Rugg, MD
Erik Mayer, BS
Pamela Sulzicki, MS, ATC
Jeremy Vail, MPT, OCS, MTC, ATC
Sharon L. Hame, MD

Introduction: Orthopaedic injury and surgery in collegiate athletes can have devastating career consequences. The purpose of this study was to analyze player-related predictors of orthopaedic surgery in NCAA athletes.

Methods: All Division I collegiate athletes at a single institution who began participation from 2003–2008 were retrospectively identified. Player-related factors, including gender, sport, and pre-college upper or lower extremity orthopaedic surgery, were elicited through pre-participation evaluations. Athletes who underwent an orthopaedic surgery in college were identified through the Sports Injury Monitoring System and medical records. Significant patient-related predictors

were identified using a multiple Cox regression model, and hazard ratios (HR) were calculated.

Results: In total, 1,142 athletes in 12 sports (baseball/softball, basketball, football, golf, gymnastics, rowing, swimming & diving, soccer, tennis, track & field/cross country, volleyball, water polo) were identified. There were 262 documented orthopaedic surgeries, including those involving the shoulder (34), hip (25), and knee (72), in 182 athletes. Pre-college lower extremity surgery was an independent predictor of orthopaedic (HR = 1.88) and knee (HR = 3.91) surgery, and type of sport was an independent predictor of orthopaedic, shoulder, and knee surgery. Lastly, athletes with a history of a pre-college orthopaedic surgery were more susceptible to another surgery in the same extremity during college (HR = 2.18).

Discussion and Conclusion: NCAA athletes who underwent a pre-college lower extremity surgery were more likely to undergo orthopaedic and knee surgery during their collegiate careers. Furthermore, athletes with a history of a pre-college orthopaedic surgery were more likely to undergo another surgery in the same extremity during college, suggesting inadequate rehabilitation or less

Notes:

9:13am – 9:17am

Delayed Anterior Cruciate Ligament Reconstruction in Pediatric Tibial Spine Fractures

Meredith Mayo, MD
Armando F. Vidal, MD
Jason Rhodes, MD
Justin Mitchell, MD
Ryan Fader, MD
Derek Axibal, PGY1
Anthony Kasch, BA

Introduction: Pediatric avulsion anterior tibial spine fractures (ATSFs) are injuries similar to adult anterior cruciate ligament (ACL) injuries. Sparse data exists regarding ATSFs later ligamentous laxity and need for ACL reconstruction. Understanding potential ACL stretch injury during initial ATSF and limited ability for the ACL to remodel midsubstance fibers, ATSF could weaken ACL and lead to delayed injury. This study aims to delineate the incidence of delayed ACL instability or rupture requiring ACL reconstruction by reviewing clinical records, examination, operative reports, and patient reporting.

Methods: We identified 101 patients between 1993-2011 who sustained an ATSF. Subjects were ages 5-18 years at injury and separated by Myers and McKeever classification into type I-III fractures. All patients had at least two-year follow-up after initial injury by clinical examination and/or via telephone. Patients were evaluated with a post-injury questionnaire and all hospital records were reviewed to evaluate demographics and post-operative course. In cases of delayed ACL reconstruction, further clinical and operative reports were reviewed.

Results: Nineteen percent of children with ATSF had delayed ACL rupture requiring reconstruction. ACL reconstruction occurred in 6.5% of Type I fractures (3/46) at a mean 51 months post-injury. Type II injuries required ACL reconstruction 29% (8/28) of the time at mean 18 months after initial injury. Three of these patients were initially managed non-operatively and converted to ACL reconstruction for recurrent instability. Eleven percent (3/27) type III fractures required later reconstruction at a mean 78 months.

Conclusions: This data suggests that a subset of ATSFs may be at risk for delayed ACL rupture, specifically type II injuries managed non-surgically. Currently, delayed ACL ruptures are unclearly related to initial injury or independent secondary event. Further patient follow-up and prospective studies are required. There is need to counsel patients that delayed ACL rupture is a potential risk after ATSF.

Notes:

9:25am – 9:29am

The Effect of Autologous Hamstring Graft Diameter on Likelihood for Revision of Anterior Cruciate Ligament Reconstruction

Lindsey Spragg, MD
Jason Chen, MA
Raffy Mirzayan, MD
Rebecca Love, BSN, RN
Gregory Maletis, MD

Introduction: The purpose of this study was to evaluate the relationship of hamstring graft diameter to anterior cruciate ligament (ACL) revision, while controlling for gender, age, BMI, femoral and tibial fixation type.

Methods: A case-control study using patients in an ACL Reconstruction Registry was conducted. A case was defined as a primary ACL Reconstruction performed with hamstring autograft that was revised during the study period (4/2006-9/2012). Three controls, defined as primary ACL Reconstructions performed with hamstring autograft who were not revised, were matched to each case according to age, gender, body mass index (BMI), femoral and tibial fixation type. Hamstring graft diameter was evaluated as the exposure of interest. Descriptive characteristics were employed and conditional logistic regression was conducted to produce estimates of odds ratio (OR) and 95% confidence intervals (CI).

Results: 124 cases and 367 controls were identified. There were no significant differences in gender distribution (52.4% vs. 52.9% male), median age (17.6 [IQR 15.9 - 20.4] vs. 17.6 years-old [IQR 15.9 - 20.4]), median BMI (23.4 [IQR 21.5 – 26.4] vs. 23.4 kg/m2 [IQR 21.6 – 25.8]), femoral fixation, and tibial fixation between cases and controls. After accounting for differential follow up of the cases, the likelihood of a patient being a case (i.e. a revision) in our cohort was 0.81 times lower (95%CI 0.66 – 0.99) for every 0.5mm increase in graft diameter from 7.0mm to 9.0mm.

Conclusions: Surgeons performing ACL Reconstruction surgery should be aware that hamstring graft diameter may influence the likelihood of success. In this study we have found that within the range from 7.0mm to 9.0mm, there is a 19% decrease in the likelihood of being a revision case with every 0.5mm increase in graft diameter. This information may help to explain the reason for some failures seen with hamstring autografts.

Notes:

9:29am – 9:33am

Osteochondral Allograft Donor-Host Matching by Femoral Condyle Radius of Curvature

Derek T. Bernstein, MD
Craig A. O'Neill, MD
Jesal N. Parekh, PhD
Hugh L. Jones, BS
Philip C. Noble, PhD
Joshua D. Harris, MD
Patrick C. McCulloch, MD

Introduction: Fresh osteochondral allograft transplantation is a surgical treatment option for patients with symptomatic chondral defects in the knee. Current methods to determine graft matching rely on side- (right versus left) and femoral condyle-specific (medial versus lateral) requisites. This frequently renders available donor tissue unfit for transplantation within the window for surgical implantation (14 to 28 days post-harvest). The purpose of this study is to determine if femoral condyle radius of curvature (RoC) is an appropriate isolated donor-host matching criterion in fresh osteochondral allograft transplantation in the knee.

Methods: Anteroposterior and lateral radiographs of 12 cadaveric distal femora were obtained and categorized as small, medium, or large. A laser scanner was used to construct digital three-dimensional models of each specimen. Each condyle was divided into three zones – anterior weight-bearing, middle weight-bearing, and posterior condyle – and a best-fit grid referencing the epicondylar axis was virtually applied to each. Sagittal and coronal RoC were determined for each segment. Circular defects measuring 20, 25, and 30 millimeters in diameter were introduced into each of the three zones on each condyle. Potential matches were assessed by sagittal and coronal RoC within a tolerance of one millimeter. Conventional side- and condyle-specific matching was also

implemented and compared to the RoC method using middle weight-bearing zone defects on each condyle.

Results: Using the RoC, 20 millimeter defects had a 100% chance of being matched. Defects of 25 and 30 millimeters had a 91% and 64% chance of being matched, respectively. Compared to the conventional method, the RoC method yielded a 3.2-fold greater overall match rate.

Discussion/Conclusion: This investigation has shown that femoral condyle sagittal and coronal radii of curvature may be useful alternative matching criteria that expand the number of matches and reduce the number of wasted grafts.

Notes:

9:33am – 9:37am

Perioperative Management and Treatment Costs of Knee Articular Cartilage Lesions

Joanne Y. Zhang, BA
Jeremiah R. Cohen, BS
Jeffrey C. Wang, MD
Frank A. Petrigliano, MD
David R. McAllister, MD
Kristofer J. Jones, MD

Introduction: The purpose of this study was to examine the direct charges associated with the perioperative management of symptomatic focal cartilage lesions of the knee.

Methods: Using a national database of private insurance billing records, we conducted a comprehensive search using Current Procedural Terminology codes to identify patients who underwent microfracture, osteochondral autograft, osteochondral allograft, and autologous chondrocyte implantation between 2008 and 2010. The associated charge codes in the one-year pre- and postoperative periods were categorized and represented as per-patient average charges (PPACs). Preoperative categories were imaging, outpatient visits, rehabilitation, and joint injections. Postoperative categories included rehabilitation and secondary procedures.

Results: Over the three-year study period, we identified 38,444 microfracture patients, 1,130 OATs, 1,071 OC allograft, and 546 ACI. The surgical PPAC was $3,990 for microfracture, $6,110 for OATs, $6,671 for OC allograft, and $10,195 for ACI. The mean preoperative and postoperative PPACs were $2,362 and $2,770, respectively, and were similar across the four surgeries. When perioperative and surgical charges were consolidated, the PPAC for ACI remained highest ($16,017) while PPAC for microfracture was lowest ($7,259). Postoperatively, 9.3% of ACI patients received secondary arthroscopies for abrasion arthroplasty or graft hypertrophy as compared to 4.7% microfracture, 4.5% OATs, and 3.2% OC allograft. Manipulation of the knee under anesthesia was performed for 4.2% of ACI patients and 1% or less of the other cartilage surgeries. Postoperative infection occurred in less than 1% of all the cartilage procedures reviewed in this study.

Conclusion: The perioperative charges for management of focal articular cartilage lesions of the knee are substantial and must be considered with clinical outcomes data to support surgical decision-making and determine the most cost-effective solution for each patient. This study finds that microfracture is a cost-effective treatment and lends support to its role as the "gold standard" in management of chondral defects.

Notes:

2015 Scientific Program
Abstracts — Friday

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

Friday, July 31, 2015

General Session 6 — Orthopaedic Practice Patterns and National Trends: Part 2

Moderator: Christopher Boone, MD

8:10am – 8:16am

Current Trends in Treatment and Outcomes Measurement in CMC Osteoarthritis

Elizabeth Lieberman, MD
Alyssa Lorzano, BS
Adam Mirarchi, MD

Introduction: There are multiple options for management of thumb carpometacarpal osteoarthritis (CMC) osteoarthritis, however, no procedure has been proven superior due to inconsistent measurement techniques. Patient reported outcomes measures (PROM) are frequently used in hand surgery, however none has been validated specifically for CMC osteoarthritis. The purpose of this study was to investigate the frequency of use and which PROMs are most commonly used to evaluate CMC osteoarthritis. We also aimed to describe common practices in diagnosis, treatment, and evaluation of CMC osteoarthritis.

Methods: An electronic survey was designed using survey software and e-mailed to members of the American Society for Surgery of the Hand (ASSH). This included 11 questions regarding treatment practices and PROMs use for CMC osteoarthritis. The survey software was used to collate and store data.

Results: 30% of the responders utilized PROMs to measure subjective outcomes of the treatment of CMC osteoarthritis. The most popular PROM was the QuickDASH (65.3%) followed by the Disability of the Arm, Shoulder, and Hand (DASH) questionnaire (25.3%). Pre-operative evaluation included history, exam, and x-ray in 99.3% of responders. Common pre-operative management techniques were splinting, steroid injections, and NSAIDs. 64.2% of responders use trapeziectomy with ligament reconstruction and tendon interposition (LRTI). Responders recorded patient satisfaction (95.3%), pain (90.3%), and activities of daily living (80.5%). Responders recorded range of motion (63.1%), pinch strength (49%), and grip strength (41.6%).

Discussion and Conclusions: This study provides new information about the use of PROMs in the evaluation of CMC osteoarthritis and expands on common practices in the diagnosis and treatment of CMC osteoarthritis. Future studies should aim to determine which PROMs are the most useful in predicting the positive diagnosis of CMC osteoarthritis and the outcomes of treatment. Additionally, future studies should assess the usefulness of PROMs in determining superiority of surgical techniques.

Notes:

8:16am – 8:22am

Demographic Trends and Complication Rates in Arthroscopic Elbow Surgery

Natalie L. Leong, MD
Jeremiah R. Cohen, BS
Elizabeth L. Lord, MD
Jeffrey C. Wang, MD
David R. McAllister, MD
Frank A. Petrigliano, MD

Introduction: The purpose of this study was to investigate demographic trends in elbow arthroscopy over time, as well as to query complication rates requiring re-operation associated with these procedures.

Methods: The Current Procedural Terminology (CPT) billing codes of patients undergoing elbow arthroscopy were searched using a national insurance database. From the years 2007 to 2011, over 20 million orthopaedic patient records were present in the database with an orthopaedic International Classification of Disease, Ninth Revision (ICD-9) diagnosis code or CPT code. Procedures and the corresponding CPT codes for the elbow searched included diagnostic arthroscopy, loose body removal, synovectomy, and debridement. The type of procedure, date, gender, and region of the country was identified for each patient. Additionally, the incidence of reoperation for infection, stiffness, and nerve injury was examined.

Results: There was a small significant increase in elbow arthroscopic procedures over the study period. Males accounted for 71% of patients undergoing these procedures. Twenty-two percent of elbow arthroscopy patients were under 20 years old, 25% were 20-39 years old, 47% of patients undergoing arthroscopic elbow procedures were 40-59 years old 6.0% were 60 or older. Other than for synovectomy, there were regional variations in the incidence of each procedure type. The overall rate of re-operation was 2.2%, with a specific rate of 0.26% for infection, 0.63% for stiffness, and 1.26% for nerve injury.

Discussion and Conclusion: Overall, the incidence of elbow arthroscopy in this patient population is relatively low, and appears to be increasing slightly over time. In this database, elbow arthroscopy procedures were most commonly performed on males and patients 40-59 years of age, with regional variation in incidence of the different procedures. Furthermore, the rate of complication requiring re-operation was low with a nerve operation being the most common re-operation performed.

Notes:

8:22am – 8:28am

Operative Versus Non-Operative Treatment of Clavicle Fractures — National Trends and Complications

Chad R. Ishmael, MD
*Claire D. Eliasberg, BA
Jeremiah R. Cohen, BS
Jeffrey C. Wang, MD
Frank A. Petrigliano, MD

Introduction: Clavicle fractures are common injuries, representing 2.6-10% of all fractures. Controversy exists over their ideal management. While traditionally treated non-operatively, recent studies have suggested improved functional outcome and lower risk of nonunion with operative fixation. The purpose of this study was to identify trends in clavicle fracture management and compare re-operation rates between operative and non-operative treatment.

Methods: Using the a patient record database, patients were identified who had undergone either non-operative or operative treatment of a clavicle fracture between 2007 and 2011 using Current Procedural Terminology (CPT) codes. Demographic and re-operation data was then acquired from the database for both treatment groups.

Results: A total of 7796 patients were treated operatively and 25,854 treated non-operatively for clavicle fracture between 2007 and 2011. The ratio of operative to non-operative treatment increased yearly from 0.29 in 2007 to 0.4 in 2011. Patients in the West were more likely to undergo operative treatment than those in other regions, and those in the Northeast less likely, with ratios of 0.45 and 0.18 respectively. Males suffered more clavicle fractures than females (25,440 vs. 8210) and were also more likely to undergo operative treatment (24.4% vs. 19.3%). Patients aged 25-49 were more likely to undergo operative treatment than those aged 15-24 and >50, with ratios of 0.66, 0.43 and 0.46 respectively. Those who underwent primary non-operative treatment were more likely to undergo later operative treatment (4.87%) than those who underwent primary operative treatment (2.45%).

Discussion and Conclusion: While most clavicle fractures are managed non-operatively, the proportion of patients treated operatively has increased across geographic regions, genders and age groups. This may suggest a change in treatment strategy and gradual trend towards operative fixation. Re-operation rates were higher for those patients initially

treated non-operatively, suggesting that operative treatment is more effective at achieving satisfactory clinical outcome.

Notes:

8:28am – 8:34am

CMN vs. DHS for Fixation of AO 31A1/2 Intertrochanteric Fractures

Michael J. Beebe, MD, BS
*Sean Thayne Tagge
Casey Whale, BS
D. Andrew Hulet, BS
Jeremy Gililland, MD
Erik N. Kubiak, MD

Introduction: This study was to retrospectively compare failure and complications associated with cephalomedullary nail (CMN) versus dynamic hip screw (DHS) fixation for intertrochanteric femur fractures at a Level I trauma center.

Methods: Intertrochanteric femur fractures were identified in 131 patients receiving a CMN and 113 patients receiving a DHS with AO 31A1.1-3, 31A2.1-3. Medical records were reviewed for demographics, surgeon training, comorbidities, complications, and subsequent hip surgery, including removal of painful hardware. Radiographs were reviewed for AO classification, reduction quality, tip apex distance (TAD), collapse, fracture, and cutout. Failure was defined as cutout, fracture, collapse of >2cm on follow-up radiographs, or revision surgery, not including removal of symptomatic hardware. Multivariate analyses were performed for complications/failure and mortality, adjusting for sex, age, date of surgery, TAD, and comorbidities.

Results: Total TAD was lower in the CMN group, median (IQR) of 17.2 compared to 23.9 in the DHS group. The failure rate was 6.9% in the CMN group and 18.6% in the DHS group. The complication rate, including failures, in the CMN group was 31.3% compared to 38.1% in the DHS group. There were no periprosthetic fractures in either group. 5.3% of patients with a CMN and 4.4% of those with a DHS required removal for painful hard. The 30-day mortality rate was 7.1% and 5.3% for DHS and CMN, respectively; one-year mortality rate was 18.6 for the DHS group and 22.9% for the CMN group.

Discussion and Conclusions: While both CMN and DHS can provide adequate fixation of intertrochanteric fractures, our data indicate that DHS has a significantly higher rate of failure. Failure in the DHS group is most commonly caused by collapse while the CMN group most often failed due to cut-out. Mortality analysis for overall, 30 day, and one-year mortality were similar between groups and comparable to historical cohorts.

Notes:

8:34am – 8:40am

Operatively Treated Talus Fractures: Complications and Survivorship in a Large Patient Sample

Michael Stone, MD
Jeremiah R. Cohen, BS
Russell Flato, BS
Geoffrey Marecek, MD

Purpose: Talus fractures are relatively uncommon. Few series have reported the complications associated with operative treatment. Although avascular necrosis is a consistently reported complication, reported rates of subsequent subtalar (ST), tibiotalar (TT) and tibiotalocalcaneal (TTC) arthrodesis vary widely. The purpose of this study was to report complications in a large patient sample of operatively treated talus fractures and to describe survivorship of open reduction internal fixation (ORIF) of the talus.

Methods: Patients who underwent ORIF for talus fracture from 2007 to 2011 were identified in the United Healthcare database by ICD-9 code 825.21 and CPT codes 28445, 28436, and 28430. Patients with a nonoperative talus fracture or iso-

lated osteochondral defect were excluded which left 1,558 patients in the final analysis. We identified adverse events including hospital readmission, wound complications, operative debridement (I&D), emergency department (ED) visits, deep vein thrombosis (DVT), pulmonary embolism (PE), and myocardial infarction (MI). We also identified patients who had subsequent arthrodesis (ST, TT, TTC) via CPT codes 28725, 28705, 28715 respectively, and noted the time elapsed between CPT codes.

Results: No patients had subsequent arthrodesis within 6 months of ORIF. Twenty-four patients (1.5%) had any arthrodesis within 1 year, sixty patients (3.9%) had arthrodesis within 2 years and two-hundred twenty-eight patients (14.6%) had arthrodesis by 4 years from ORIF. Sixty-nine patients (4.4%) had wound complications that were treated without surgery, 11 (0.7%) were readmitted to the hospital, 206 (13.2%) went to the ED, and 100 (6.4%) underwent I&D in the operating room. There were 27 (1.7%) DVTs, and no MI or PE. The overall complication rate was 19.5%.

Conclusions: Open reduction internal fixation of talus fractures results in good survivorship at 4 years. Medical complications and hospital readmission are rare, but infection requiring I&D is relatively common.

Notes:

Friday, July 31, 2015

Rapid Fire Session 7A — Academics

Moderator: T. Ty Fowler, MD

8:55am – 8:59am

The Role of Peer Reviewed Research in the Orthopaedic Surgery Residency Match

Sean T. Campbell, MD
Ryan Gupta, BS
Raffi S. Avedian, MD

Introduction: Research is an important factor used in evaluating applicants to orthopaedic training programs. Current reports regarding the publication rate among prospective residents are likely inaccurate. It is unknown whether research productivity is weighted more heavily at programs affiliated with research-driven institutions. The purpose of this work was to establish accurate baseline data on publication rate among applicants to orthopaedic residency programs and to compare publication rates between applicants who matched at historically research-focused institutions and those who matched elsewhere.

Methods: We performed a literature search for each U.S. resident in the 2013-2014 intern class. Number of publications: 1) in total, 2) in orthopaedic journals, and 3) as first/last author were recorded. Publication rate at the top twenty-five programs (according to medical school and departmental NIH funding and U.S. News ranking) was compared statistically against all other programs.

Results: Average number of publications per intern for all programs was 1.28 ± 0.15. Number of total and first/last author publications was significantly greater for programs at medical schools and affiliated with departments in the top 25 for NIH funding, and at medical schools in the top 25 U.S. News rankings. Publication rate in orthopaedic journals was significantly higher for programs affiliated with departments in the top 25 for NIH funding and at top 25 U.S. News medical schools.

Discussion and Conclusions: The average matched applicant to an orthopaedic residency program publishes in the peer-reviewed literature less frequently than previously reported. Matched applicants at research-focused institutions tended to have more publications than those who matched at other programs.

Notes:

8:59am – 9:03am

The Ability of a Teaching Skills Education Program to Improve Orthopaedic Residents' Skills as Teachers

Dustin Schuett, DO
Joseph Carney, MD
Lucas McDonald, MD, MPH

Introduction: A substantial portion of Resident education occurs through teaching interactionsamongst Residents. Optimizing teaching encounters for Intern and Intermediate Level residents is essential given the decreased work hours for Residents at this level due to work hour restrictions. There is a paucity of literature addressing the ability to optimize teaching ability of Residents.

Methods: A teaching skills education program was established based on the One-Minute Preceptor model. Intermediate Residents tasked to manage an Acute Care Orthopaedic Surgery Clinic as an assigned rotation were randomized to receive the teaching skills program. Interns rotating through the Acute Care Clinic completed anonymous evaluations of the Intermediate Residents managing the clinic. Evaluation results of trained Intermediate Residents were compared to untrained Intermediate residents who rotated through the same rotation at different times.

Results: There was no difference between the trained and untrained Intermediate Residents with regard to feedback given, quality of feedback given, useful clinical information taught and suggestions for improvement given. There was no difference in the percentage of each group described as an effective teacher or as having a positive impact on the education of the rotating interns. Untrained PGY3's were more likely to be considered a strong teacher than trained PGY2 residents. Finally, there was no difference with regard to the perceptions of whether or not the Intermediate Resident had received training in teaching.

Discussion and Conclusion: The implementation of a formal teaching skills program directed at Intermediate Level Residents was unable to improve the teaching abilities of the residents trained. Time in training was most predictive of teaching ability.

Notes:

9:03am – 9:07am

Objective Evaluation of Motor Skills Training Effectiveness for Orthopaedic Residents Utilizing a Haptic Motion Tracking Drill System

Deana Mercer, MD
Ashkan Pourkand, MS
Christina Salas, PhD
David Grow, PhD

Introduction: The purpose of this study is to present preliminary data on the development of a motion tracking drill system for advanced surgical skills training outside of the operating room.

Methods: A rotary handpiece with dual trigger and drilling attachments was adapted to a commercial haptic device and additional sensors to measure tool position, acceleration, and acoustic data. Seven participants with varying levels of surgical skills training (medical student, resident years 1-5, and orthopaedic surgery attendings) were asked to perform a single task: drill a hole at 45° from normal through both cortices of the diaphysis of a synthetic distal radii while avoiding excessive over penetration of the second cortex. Each participant performed this task three times. Spatial parameters related to bone drilling include: hole length; over penetration distance; hole minor-axis diameter; hole major-axis diameter; hole major-axis error; drill angle; minimum and maximum velocity; mean roll, pitch, and yaw of drill; vibration in x and y coordinates. A correlation matrix for all variables was generated ($p=0.05$).

Results: In total, twenty-four independent statistically significant correlations were found. Among these, the data suggests that experienced drill users pitch the drill forward. Inexperienced users have a tendency to overestimate the drill angle and externally rotate the drill (yaw). Users with a high maximum velocity and those who rolled the drill had a high over penetration distance. Users who pitch the drill forward minimize roll and yaw of the drill.

Discussion and Conclusion: Although limited data was used for this analysis, key differences in drilling technique were foundamong study participants depending on level of experience. A larger study with more participants will further elucidate the differences between novice and experienced orthopaedic surgeons. These results may then be used to evaluate residents and customize their training experience.

Notes:

9:15am – 9:19am

Fluoroscopic Image Acquisition Variability During Operative Fixation of Ankle Fractures

Dorothy Harris, MD
Ronald W. Lindsey, MD

Introduction: Increased use of intraoperative fluoroscopy exposes patients and operating room personnel to increased radiation. Patient-, injury-, and surgeon-specific factors related to fluoroscopic use in common orthopedic procedures are not well defined. The purpose of this study was to determine if injury, surgeon training level, and patient factors are associated with increased fluoroscopy during open reduction and internal fixation (ORIF) of ankle fractures.

Methods: The study was a retrospective chart review of patients treated at an academic institution with primary ORIF of an ankle. Patient demographics, including sex, age, and BMI were collected, as was surgeon year in training (residency and fellowship). Image acquisition data included total number of images, total imaging time, and cumulative dose. Ankle fractures were classified according to the Weber and Lauge-Hansen classification and the number of fixation points. Bivariate analysis and multiple regression models were used to predict increasing fluoroscopic image acquisition.

Results: A total of 158 patients were identified; 58 were excluded. Following bivariate analysis, fracture complexity and year in training showed a significant correlation with increasing image acquisition. Fracture complexity and year in training retained clinical significance and were independent predictors of increased image acquisition after multiple regression analysis. Increasing fracture complexity resulted in 20 additional shots, 16 additional seconds, and a radiation increase of 0.7 mGy. Increasing year in training resulted in an additional 6 shots and an increase of 0.35 mGy in cumulative dose.

Discussion and Conclusion: This study demonstrated that year in training and fracture complexity are significantly correlated with increasing fluoroscopic image acquisition, and these factors are independent predictors of increased fluoroscopy use. The findings suggest that protocols aimed at educating trainee surgeons on minimizing use of fluoroscopy would be beneficial at all levels of training and should target multiple fracture patterns.

Notes:

9:19am – 9:23am

Risk of Contamination in Orthopaedic Surgical Instruments

Ryan Mayer, BS
S. Samuel Bederman, MD, PhD, FRCSC
Vincent Colin, MD
Martina Berger, PhD, MS
Thomas Cesario, MD
Ran Schwarzkopf, MD, MSc

Introduction: Wound infection following surgery is a devastating complication to both patients and society with adverse sequelae including worse clinical outcomes, prolonged pain, and higher costs. These infections can occur from a number of different sources of contamination, one being the surgical instruments used during the procedure. Because instruments are rarely designed to be completely disassembled prior to sterilization, the goal of this study is to compare the contamination level between disassembled and assembled surgical instruments.

Methods: Two spinal pedicle screwdrivers and two standard hip femoral component broach handles were modified so that they could be disassembled, and then contaminated with a tryptic soy broth (TSB) suspension containing on average 4.0 x 106 *Geobacillus stearothermophilus* organisms per milliliter. One instrument from each pair was then reassembled and the other instrument was kept in the disassembled state. The instruments were then steam sterilized, with five rounds of the

experiment sterilized at 132°C for 40 minutes and the other five rounds sterilized at 132°C for 20 minutes. Following sterilization, the instruments were swabbed in five target locations for remaining bacteria or spores. The samples were then placed in 3.5 mL of TSB, incubated for seven days at 55°C and checked for growth by subculture on agar plates.

Results: Bacterial growth was detected from control samples of the TSB suspension during each round of the experiment. Eradication of vegetative bacteria and spore forms was achieved at all target locations in both the assembled and disassembled instruments following steam sterilization at 132°C for 40 minutes and at 132°C for 20 minutes.

Discussion and Conclusion: Our study demonstrates that adequate decontamination of the tested surgical instruments can be achieved following steam sterilization in either the disassembled or assembled state, and there is no increased risk of infection transmission.

Notes:

9:23am – 9:27am

A Resident-Led Initiative Improves Treatment Rates of Vitamin D Deficiency

Drew Lansdown, MD
*Jeffery J. Barry, MD
Amanda Whitaker, MD
Rosanna L. Wustrack, MD
Aenor Sawyer, MD
Erik N. Hansen, MD

Introduction: Acute hip fractures carry a high risk of morbidity and are associated with low vitamin D levels. Multiple studies have demonstrated that adhering to process-based improvements can result in a higher quality of care. There are existing models for housestaff quality improvement initiatives, though none from orthopaedic surgery residency programs. The purpose of this study is to evaluate the effects of an orthopaedic surgery resident-led initiative to improve screening and treating vitamin D deficiency in patients with acute hip fractures.

Methods: An administrative database identified 283 patients treated surgically for an acute hip fracture between July 2010 and June 2014. This period included two years prior to program initiation (Year 1, N=65; Year 2, N=61), the initial program year (Year 3, N=66), and the subsequent program year (Year 4, N=91). Patient demographic information, comorbidities, and treatment details were recorded. The primary endpoints were the rates of screening for and treating vitamin D deficiency. Chi-squared tests were used to evaluate the difference in screening and treating rates.

Results: Screening rates were significantly improved after initiation of the resident-lead QI program, with screening performed for 30.8% of patients in Year 1, 19.7% of patients in Year 2, 45.5% of patients in Year 3, and 87.9% of patients in Year 4. Vitamin D supplementation was initiated for 33.3% of patients in Year 1, 27.9% in Year 2, 50.0% in Year 3, and 75.6% in Year 4. There were no significant differences with regards to patient demographics, fracture type or treatment rendered across these four years.

Discussion and Conclusions: The implementation of a resident-led quality improvement project resulted in significantly higher rates of screening and treating vitamin D deficiency for patients with acute hip fractures. Housestaff-based initiatives may be an effective way to improve the quality of care.

Notes:

Friday, July 31, 2015

Rapid Fire Session 7B — Foot and Ankle

Moderator: James Meeker, MD

8:55am – 8:59am

Does Syndesmosis Fixation Affect the Fibulotalar Relationship?

Nicholas G. Vance, MD
Robert C. Vance, BS
William T. Chandler, BS
Vinod K. Panchbhavi, MD

Introduction: The study was designed to determine whether overtightening of syndesmotic screws would cause widening of the lateral clear space.

Methods: A 3D finite element model was constructed and analyzed using geometries from a computed tomography scan of a lower leg. Starting 2 cm from the tibial plafond, screw fixation was simulated at 5 mm increments up to a distance of 5 cm from the plafond. The fibula was compressed 2 mm toward the tibia at each interval, and the change in distance between to the lateral talus and distal fibula was measured.

Results: Medial deflection of the fibula resulted in widening of the lateral clear space, which was proportional to the amount of deflection. The effect increased as screws were placed closer to the plafond, with 1.5 mm of widening at 2 cm (0.76 mm/mm) vs 0.7 mm at 5 cm (0.34 mm/mm).

Conclusion: There has been historical debate as to whether the syndesmosis can be overtightened during surgical fixation. This model demonstrates that overtightening of the syndesmosis with medial fibular displacement does cause widening of the lateral clear space. The results also suggest that screws placed farther from the plafond do this to a lesser degree, which may be advantageous during surgical fixation.

Notes:

8:59am – 9:03am

Evaluation of the Distal Tibiofibular Joint Using Dynamic Fixation

Ryan O' Shea, MD
Yasir Khan, MD
William Camisa, MS
Jeremi Leasure, MS
Michael T. Krosin, MD

Introduction: In patients with ankle fractures and syndesmotic instability the position of the distal fibula within the incisura fibularis is critical to the stability of the ankle and the transmission of force to the talus. Malreduction of the syndesomosis is associated with a poor functional outcome. A novel dynamic fixation known as a tightrope may present an advantage over traditional rigid screw fixation as it allows for micromotion at the joint. We propose a biomechanical evaluation into the tightrope's ability to correct syndesmotic malreduction compared to traditional fixation.

Methods: Twelve specimens were malreduced with a screw or tightrope before undergoing multiaxial fatigue testing. All specimens were CT scanned before surgical intervention, after malreduction, and at the end of biomechanical testing in order to evaluate tibiofibular movement. Change in axial rotation and anterior/posterior translation of the syndesmotic joint was measured.

Results: Measurements indicate that the initial malreduction in specimens implanted with a screw was similar to the specimens implanted with a screw. After gait loading the malreduction in the screw was 2.0 +/- 2.4 mm anteriorly, 0.39 +/- 0.5 mm medially and 3.3 +/- 2.9 degrees in external rotation. After gait loading, measurements in specimens implanted with a tightrope moved to a more anatomical position of 0.1 +/- 2.6 mm anteriorly, 0.32 +/- 0.9 mm medially and 0.1 +/- 1.6 degrees in internal rotation.

Discussion and Conclusion: Results show significant medial/lateral correction after cycling the fixed specimens and measurements taken of anterior/posterior translation trend towards more correction in specimens with tightrope fixation. Traditional treatment with open reduction and syndesmotic screw fixation may result in a rate of syndesmotic malreduction that exceeds 50%, often associated with poor functional outcomes. The implications of this study indicate that using a more dynamic fixation may reduce these malreductions and, as a result, the poor outcomes during fixation.

Notes:

9:03am – 9:07am

Ankle Fracture Dislocations: The Extruded Distal Tibia

Timothy B. Alton, MD
Reza Firoozabadi, MD, MA

Introduction: Open distal tibia fractures are prone to soft tissue complications. We describe a subclass of open injury that occurs when the ankle joint is dislocated and the distal tibial articular surface is extruded from the body, the extruded distal tibia (EDT). The purpose of this study was to evaluate potential complications in open ankle fracture dislocations with EDT.

Methods: We evaluated post-operative complications and rates of return to the operating room in 12 patients with EDT and compared them to matched controls with open ankle fracture dislocations. This was a retrospective review of prospectively gathered data at a Level 1 trauma center.

Results: 166 patients with open ankle fractures were identified between January 2009 and October 2014. 12 presented with radiographic evidence of EDT. Controls were matched based on Gustillo-Anderson (GA) type, Injury Severity Score, wound length and comorbid conditions (smoking, diabetes, workers compensation and neuropathy). Follow-up averaged 610 days (71-1754). The EDT group included 3 GA type II, 8 type IIIa and 1 type IIIb injuries with an average wound length of 14 cm (3-40). The EDT group had a complication rate of 66.7% compared to the control group with a complication rate of 16.7%. EDT complications included 2 below-knee amputations, 2 free-flaps, 2 symptomatic malunions requiring revision, 1 skin graft and 1 deep infection. The control group only had one below-knee amputation and one malunion requiring revision.

Discussion and Conclusion: Patients with open ankle fracture dislocations and EDT, even those with GA type II open injuries, represent a more severe subset of open ankle fractures. These patients have increased rates of post-operative complications including deep infection, the need for soft tissue coverage and even amputation and should be apprised of these risks.

Notes:

9:15am – 9:19am

Biomechanics of Acutrak Screw Fixation of Vertical Medial Malleolus Fractures

Adam M. Wegner, MD, PhD
Michael A. Robbins, BS
Tanya C. Garcia-Nolen, BS, MS
Philip R. Wolinsky, MD
Derek F. Amanatullah, MD, PhD

Introduction: Vertical shear fractures of the medial malleolus occur with supination-adduction loading. Although two parallel unicortical partially threaded cancellous screws are the gold standard for fixation of these fractures, fully threaded headless screws potentially offer several advantages for fixation. This study will compare the biomechanical properties of these two methods.

Methods: Vertical shear fractures were simulated by identical osteotomies created 17.5 mm lateral to the tip of the medial malleolus in twenty synthetic distal tibiae. The models were fixed with either 1) two parallel 3.5 mm diameter partially threaded 40 mm cancellous screws parallel to each other in the transverse plane or 2) two 4.7 mm diameter 45 mm titanium screws parallel to each other in the transverse plane. Specimens were then subjected to offset axial loading at 1 mm/s to simulate supination-adduction loading.

Results: There was a statistically significant increase in the average stiffness with titanium screws (244 ± 58 N/mm) when compared to partially threaded cancellous screws (111 ± 35 N/mm). There was a statistically significant increase in the average load for 2 mm of fragment displacement with the titanium screws (483 ± 91 N) when compared to partially threaded cancellous screws (278 ± 49 N). When the

specimens were displaced to 6 mm and allowed to relax, the titanium screw constructs reduced to the pretesting fragment alignment while the parallel cancellous constructs remained displaced.

Discussion and Conclusion: Parallel titanium compression screws resulted in a stiffer construct than parallel cancellous screws, required more force to generate 2 mm of displacement than parallel cancellous screws, and self-reduced to the pretesting fragment alignment after displacement. The headless design of the titanium screws may decrease soft tissue irritation and offer improved fixation of vertical shear fractures of the medial malleolus.

Notes:

9:19am – 9:23am

Return to Sport Following Operative Treatment of Osteochondral Talus Lesion

Andrew Jackson, MD
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Background/Introduction: Osteochondral lesions of the talus are one of the most common talar injuries observed in athletes. Maintaining the integrity of the chondral surface of the talus is critical in preventing the degenerative cascade leading to osteoarthritis. The purpose of this study is to analyze the outcomes of operative repair of osteochondral lesions of the talus in the young athlete, focusing on the athletes ability to return to sport without limitation.

Objective: To determine the ability of athletes to return to sport following operative repair of an osteochondral lesion.

Methods: A retrospective review of all osteochondral lesions of the talus treated with from January 2010 to December 2012 was conducted. Data were collected from operative reports and electronic medical records.

Results: There were a total of fifty-four operative microfracture cases performed during the study period (24 microfracture and 30 OATs). Outcomes were characterized as excellent, good, or poor. Excellent was defined as being able to return to previous level of sport. Good was defined as able to return to sport but with some limitation or a requiring a second operation. Poor was defined as being unable to return to sport. There were 8 excellent, 11 good and 5 poor in the microfracture group. In the OATs group there were 10 excellent, 13 good and 7 poor.

Conclusion: In conclusion, operative treatment of osteochondral lesions of the talus in this young athletic population allowed approximately 78% of athletes to return to sport, however, 57% of them were unable to return to previous levels or required a second operation. 22% of those treated were unable to return to sport. Overall operative treatment of osteochondral lesions of the talus is a successful procedure that allows the majority of athletes to return to sport.

Notes:

9:23am – 9:27am

Incidence of Deep Venous Thrombosis in Calcaneal Fractures

Joan R. Williams, MD
Milton T. M. Little, MD
Stephen K. Benirschke, MD

Introduction: Calcaneus fractures represent a complex injury that can lead to significant morbidity despite surgical treatment. Many characteristics contribute to poor outcomes in patients, but the most common cause is early operative intervention through a damaged, swollen, or blistered soft tissue envelope. To limit those risks, calcaneus fracture surgical intervention is often delayed until the soft tissue envelope is deemed safe. This prolonged period of limited mobility may place patients at increased risk for the development of deep vein thrombosis (DVT) both pre- and postoperatively. It is our hypothesis that due to the nature of the trauma and significant

period of immobilization prior to surgical fixation, the incidence of preoperative DVT is higher in patients with calcaneal fractures than the reported incidence of 1-3.1% for other isolated lower extremity fractures.

Methods: After approval from our institutional review board, we conducted a retrospective review of all operatively treated isolated calcaneal fractures from 2005-2013 by a single surgeon that presented in an outpatient setting. All patients included in the study were over the age of 18, had a preoperative duplex ultrasonography of bilateral lower extremities per the treating surgeon's protocol, and had at minimum 6 weeks follow-up. Patients were excluded if they were a polytrauma, had a documented hypercoagulable state, or were on baseline pharmacologic anticoagulation for another condition.

Results: Of these 160 patients, 19 (12%) were found to have a DVT preoperatively. There were 16 males, and 3 females in this DVT group. The average age was 53.4 25-74) years and average BMI was 23.4 (18.5-33.3)kg/m2. There were 7 former and 4 current tobacco users in this group and one female was on hormonal replacement therapy. None of these patients had a history of DVT or diabetes. All of the DVTs were in the operative extremity with the exception of one patient who had bilateral DVTs. The average time to surgery for the patients who had a DVT was 23.6 (11-105) days. The majority of DVTs were found in the peroneal vein (10), followed by the soleal (6), and intramuscular calf veins (5). Seven patients had DVTs in multiple veins in the leg. The patient who had bilateral DVTs had them in the posterior tibial vein in both legs. Only 2 (1.25%) patients had DTs in a proximal vein. All patients except for one were treated. The patients were treated with Coumadin or Lovenox and one patient required inferior vena cava filter placement (IVC).

Discussion and Conclusion: The incidence found here is almost 12 times as high as nay previously published examination of lower extremity injuries. Further examination into the possible sequelae of these DVTs and the treatment strategies in preparation for the operative fixation of these patients is warranted. Both physicians and their patients should be aware of their 12% risk of preoperative DVT with isolated calcaneal fractures.

Notes:

Friday, July 31, 2015

Rapid Fire Session 7C — Spine

Moderator: Nitin N. Bhatia, MD

8:55am – 8:59am

A Novel In Vivo Mouse Model of Implant Related Spine Infection

Erik M. Dworsky, MD
Anthony Scaduto, MD
Alexandra I. Stavrakis, MD
Amanda H. Loftin, BS
Sherif A. Richman, BS
Yan Hu, MD
Nicholas M. Bernthal, MD

Introduction: Implant-related infection has been reported to occur in 3-10% of implant-related spine surgeries, causing significant patient morbidity and mortality as well as enormous additional health care spending. Existing animal models of spinal implant infection are histology-based and in large animals, requiring euthanasia of the animal for a single data point. The purpose of this study was to establish an in vivo mouse model of spinal implant infection that utilizes optical imaging to longitudinally evaluate postoperative bacterial burden humanely, efficiently, and accurately.

Methods: Survival surgery was performed in which a stainless steel implant was press fit into the spinous process of L4 and placed longitudinally along the posterior elements. The mice were then inoculated with 1x10^2, 1x10^3, 1x10^4 colony forming units (CFU) of bioluminescent S. aureus or sterile saline (control group). Bacterial burden was tracked longitudinally with quantitative bioluminescence imaging up to postoperative day (POD) 14 at which point the implants and surrounding tissue were extracted and cultured. Additionally, variable-pressure scanning electron microscopy (VP-SEM) was performed to qualitatively evaluate biofilm formation on the implant surface.

Results: All groups inoculated with S. aureus had a significantly higher bioluminescence signal in comparison to the control group throughout the 14 day imaging period. The bacterial bioluminescence signal peaked POD5 in all groups and remained above baseline signal throughout the imaging period. Implant CFU counts were significantly higher in

the 1x10^3 and 1x10^4 groups and tissue CFU counts were higher in all inoculated groups in comparison to the control group. All animals in the 1x10^4 CFU group developed skin breakdown secondary to infection whereas no animals in the other groups had evidence of skin breakdown. VP-SEM imaging confirmed evidence of biofilm formation in all three inoculated groups.

Discussion and Conclusion: 1x10^3 CFU is the ideal inoculum of S. aureus to establish a chronic implant-related infection that can be monitored noninvasively with bioluminescence imaging. This mouse model of postoperative implant-related spine infection represents a novel approach to study new therapeutic strategies.

Notes:

8:59am – 9:03am

The 2 Axis Theory of Lumbar Rotation

P. Douglas Kiester, MD
S. Samuel Bederman, MD, PhD, FRCSC

Introduction: The current literature without any known exceptions places the lumbar axis of rotation in highly variable locations within the vertebral body anterior to the spinal canal. Current research by the authors, however, shows incontrovertibly that the facets form a hard boney axis of rotation in the midline immediately posterior to the spinal canal. One possible solution that resolves this dissonance is the proposed 2-axis theory of lumbar rotation.

Methods: This is a theoretical model formulated after years of research including facet anatomy, lumbar cine-radiographs of lumbar rotation, 3D computer reconstructions and trials, CT scans, disk anatomy and function, adult deformity (scoliosis) formation, vertebral body endplate cartilage, and other studies.

Results: Imagine a spinning teacups carnival ride. All of the teacups are on a plate which rotates about its major axis, while the teacups spin on their individual segmental axes. As the major axis rotates the entire vertebral body away from the midline, the segmental facet axis rotates the vertebral body back toward the midline. One of the many advantages of this elegant design is the body's ability to instantly change the location of the major axis to keep it centered on the body's center of gravity which is constantly changing as we lift items, change direction, and do sports.

Conclusion and Discussion: This model explains why there is cartilage on the vertebral body endplates and the pathomechanics of the initiation of adult deformity (scoliosis) curves. It also minimizes torsional stresses on the great vessels, and efficiency in the body's balance maintaining structures. The model makes clear why the lumbar artificial disk fury several years ago was unsuccessful. The disk functions as a hydraulic compression chamber which is compressed in rotation, then springs-back passively to midline neutral.

Notes:

9:03am – 9:07am

The Pedicles Are Not the Densest Regions of the Lumbar Vertebrae

Eric Hohn, MD
*Ryan O'Shea, MD
Bryant Chu, BS
Audrey Martin, BS
Jeremi Leasure, MS
Dimitriy Kondrashov, MD

Introduction: Bone mineral density (BMD) is a major factor in fixation construct strength. The traditional region for implant fixation is the pedicle; however, other regions may present as more viable options with higher bone quality. Previous research describes a correlation of CT Hounsfield Units to BMD to determine bone quality of various anatomic regions within cervical vertebrae. Similar densitometry of the lumbar spine has not been reported. Our objective was to describe the bone quality of the various anatomical regions within lumbar vertebrae. The bone quality of seven different

anatomical regions of the lumbar vertebrae were compared using a hybrid CT-to-BMD conversion process.

Methods: The spine was digitally isolated by applying a filter for adult bone. Using this and manual segmentation, the spine model was separated into five vertebrae, followed by segmentation of each vertebra into seven regions and determination of average HU. HU was converted to BMD with calibration phantoms of known BMD.

Results: Overall mean BMD in vertebral regions ranged from 172–393 mg/cm3 with the highest and lowest BMD in the lamina and vertebral body, respectively. Vertebral regions formed three distinct groups. The vertebral body and transverse processes represent one group with significantly lower BMD than other regions. Spinous process, pedicles, and superior articular processes represent a second group with moderate BMD. Finally, inferior articular process and lamina represent a third group with significantly higher BMD than other regions.

Discussion and Conclusion: Standard lumbar fusion currently uses the vertebral body and pedicles as primary locations for fixation despite their relatively low BMD. Utilization of posterior elements, especially the lamina and IAP, may be advantageous as a supplement to modern constructs or the primary site for fixation, possibly mitigating construct failures due to loosening or pull-out.

Notes:

9:15am – 9:19am

Biomechanical Assessment of L5 Nerve Root Strain in a 3D Printed High-Grade Spondylolisthesis Model

Stephen Keunheng Huo, MD
*Alexander B. Peterson, BA
S. Samuel Bederman, MD, PhD, FRCSC
Ross Hunter, BS
Lauren Nguyen

Introduction: Operative reduction of high-grade spondylolisthesis remains controversial given the potential for nerve damage. As the L5 nerve root is the most commonly affected nerve, our study assessed the L5 nerve strain during both rotatory and translational reduction maneuvers to determine the reduction technique that minimizes nerve strain.

Methods: A 3D printed lumbar spine and sacrum, rendered from the CT scan of a patient with grade 3 spondylolisthesis, was utilized. A custom testing jig situating the spine in the prone position to simulate intra-operative layout allowed for two reduction techniques: translation-dominant and rotation-dominant. Two starting positions (75% slip) were set at neutral (A1) and 15 degrees of relative lordosis (A2). Two ending positions (0% slip) were set at neutral (B1) and 15 degrees of relative kyphosis (B2). This allowed for four different reduction paths (A1-B1, A1-B2, A2-B1, A2-B2). . A 3D motion tracking device was used to measure the distance between two anatomic reference points used to represent L5 length during reduction from 75% to 0% slip. To ensure repeatability, all reductions were repeated 10 times each by two experimenters. Repeated-measures ANOVA and paired t-tests were used in statistical analysis.

Results: Strain values for both reduction types showed a linear increase throughout the full reduction. The A1-B1 rotational path produced the least strain (77.8%). The A1-B2 rotational path showed the greatest strain (95.5%). There was limited significance found between the two reduction techniques. The B2 kyphotic ending position produced significantly greater strain within both techniques.

Conclusion: To minimize L5 injury during surgical reduction of spondylolisthesis, either a rotation-dominant or translation-dominant reduction with the patient in neutral or lordotic positioning is recommended. Fusing the spine in a final kyphotic position is not recommended.

Notes:

9:19am – 9:23am

A Comparison of Anterior and Lateral Approaches for Lumbar Interbody Fusion in the Treatment of Degenerative Spondylolisthesis

Tianyi Wang, MD
Grace Xiong, BS
Justin B. Ledesma, MD
Ma Agnes Ith, PhD
Michael R. Briseno, MD
Robert T. Arrigo, BS, MS
Ivan Cheng, MD

Introduction: The lateral (trans-psoas) approach to lumbar interbody fusion has recently been introduced as a less-invasive alternative to an anterior interbody fusion with potentially accelerated postoperative recovery. Early clinical studies, however, have described complications such as lumbar plexus injury and thigh weakness. This study was performed as a retrospective cohort comparison to compare outcomes between a traditional anterior lumbar interbody fusion and the lateral interbody fusion to treat degenerative spondylolisthesis.

Methods: Consecutive patients who received either anterior or lateral lumbar interbody fusions performed for degenerative spondylolisthesis at a single institution between 2008 and 2012 were identified by CPT code or operative report documentation. Basic demographic data, operative details, and preoperative and postoperative notes were analyzed. VAS-Back, VAS-Leg, and Oswestry Disability Index (ODI) scores were prospectively collected for clinical follow-up.

Results: 37 patients were identified in the lateral-approach group and 141 patients in the anterior-approach group with a mean follow-up of 4.0 years for each group. Patients in the lateral-approach cohort were generally older, more likely female, with similar BMI than patients receiving the anterior-approach. Though operative time was similar for both groups, patients receiving the lateral-approach demonstrated significantly lower operative blood loss (140cc vs 341cc). A shorter average length of stay was found for patients receiving lateral approach (4.2 days vs. 6.0 days), though not statistically significant. Patients receiving both approaches demonstrated significant improvements in VAS-Back, VAS-Leg, and ODI scores but no differences were seen between groups at final follow-up

Discussion and Conclusion: This retrospective study found decreased operative blood loss in patients receiving lateral approach for lumbar interbody fusion in the treatment of degenerative spondylolisthesis. No clear advantage in patient-reported outcomes were found between the two groups.

Notes:

9:23am – 9:27am

Outcome of Concentrated Bone Marrow Aspirate with Demineralized Bone Matrix and Allograft in Combined Posterolateral and Transforaminal Lumbar Interbody Fusion

Remi M. Ajiboye, MD
Mark A. Eckardt, BA
Jason T. Hamamoto, BS
Jeffrey C. Wang, MD

Introduction: Iliac crest bone graft (ICBG), as a fusion aide, is considered the "gold standard" in spine surgery. However, it is linked with certain potential donor-site morbidities. Cell-based therapies such as concentrated bone marrow aspirate (BMA) have been developed as a potential alternative to ICBG. BMA can be obtained via a relatively non-invasive method, avoiding some of the donor-site morbidities often associated with ICBG harvest. BMA contains mesenchymal stem cells (MSC) and growth factors that can confer osteogenic and osteoinductive potential to osteoconductive scaffolds such as allograft and demineralized bone matrix (DBM). The goal of this study is to describe the outcome of concentrated BMA with DBM and allograft in patients undergoing combined transforaminal lumbar interbody fusion (TLIF) and posterolateral fusion (PLF).

Methods: Eighty patients with a minimum of 12 months of follow-up were evaluated. Radiographic fusion was evaluated using dynamic radiographs and/or computed tomography scan. Rates of reoperation and complications (including

infection, pseudoarthrosis, hardware complications and graft donor-site morbidities) were evaluated. Clinical outcomes were assessed based on a 4-grade system: excellent, good, satisfactory and poor, in accordance with the modified Odom's criteria.

Results: Radiographic evidence of solid posterolateral and interbody fusions were 81.2% (65/80) and 92.5% (74/80), respectively. Seven (8.75%) patients developed hardware-related complications, 2 (2.5%) patients developed an infection, 2 (2.5%) patients developed clinical pseudoarthrosis and none of the patients developed graft donor-site morbidities. 20 (25%) patients required reoperations. Excellent or good outcomes were achieved in 58 (72.5%) patients.

Conclusion: Patients undergoing combined TLIF and PLF using concentrated BMA with DBM and allograft can achieve successful fusion with good clinical outcomes and relatively low complication rates. Given the concerning potential adverse effects associated with ICBG donor-site morbidities, concentrated BMA with DBM and allograft may be an appropriate bone graft alternative.

Notes:

Friday, July 31, 2015

Rapid Fire Session 7D — Shoulder

Moderator: James Van Den Bogaerde, MD

8:55am – 8:59am

Benzoyl Peroxide Shoulder Skin Preparation and Deep Colonization with P-Acnes

Wesley Nottage, MD
Diana Lau, MD
Michael Chuang, MD
Vivian Mendoza, MD

Introduction: Propionibacterium acnes (P. acnes) has been shown to be the primary causative pathogen in post-operative shoulder infections, from arthroplasty to arthroscopy. The leading theory is that the shoulder joint is inoculated with the bacteria during skin incision secondary to P. acnes colonization in the dermal layer of the skin. The purpose of our study was to investigate whether benzoyl peroxide may be used as a pre-operative surgical skin preparation to decrease the skin colonization rate and hence, the intra-articular colonization rate of P. acnes.

Methods: Nineteen consecutive patients indicated for shoulder arthroscopy that met the inclusion criteria were prospectively recruited to participate in our IRB approved study. Cultures were taken in the operating room from the skin overlying the posterior, anterosuperior and anterolateral arthroscopy portal sites in 19 patients (15 male, 4 female). A benzoyl peroxide 10% wash was applied to the shoulder and left on for 1 minute. This product was then removed with sterile saline and culture samples were recollected from the same three standard portal sites. Shoulder arthroscopy proceeded as indicated with final cultures obtained at the conclusion of the procedure from the deep surgical site, via a cannula.

Results: The pre-operative-pre-skin preparation colonization rate of P. acnes on the skin surgical portal sites was 84.2% (16 of 19 patients). The benzoyl peroxide wash eliminated P.acnes in 4 patients (21.1%) but also produced deep positive cultures in 3 patients (15.8%) whose initial skin cultures were negative for the bacteria. There was overall no significant decrease in superficial P. acnes colonization rate at the skin following the benzoyl peroxide topical prep. The post-operative surgical site inoculation rate was similar to our previous studies at 15.8% (3 of 19 patients), with 100% of deep cultures having a positive superficial skin culture for P.Acnes.

Conclusions: Benzoyl peroxide 10% wash was not effective at decreasing the colonization rates of cutaneous P. acnes bacteria prior to arthroscopic shoulder surgery, and did not decrease the incidence of deep colonization at the surgical site.

Notes:

8:59am – 9:03am

Early Complications of Acromioclaviclar Joint Reconstruction Requiring Reoperation

Benjamin Bluth, MD
Jeremiah R. Cohen, BS
Dean Wang, MD
Frank A. Petrigliano, MD

Introduction: Prior studies have reported high operative complications with acromioclavicular joint reconstruction but many of these reports have suffered from small sample sizes or the inclusion of older surgical techniques.

Methods: We queried a large insurance database for all patients who underwent AC joint reconstruction with or without graft (CPT codes 23552 and 23550, respectively) from the time period between 2007 and 2011. These cases were then evaluated for post-operative infection requiring formal irrigation and debridement within 30 days as well as failed reduction requiring revision acromioclavicular joint reconstruction within 6 months. The data were then stratified by age, sex, and geographic region.

Results: 2,155 patients were identified as having undergone AC joint reconstruction. 701 patients were between 10 and 29 years old, 989 between 30 and 49, and 465 between 50 and 69. 84% were male. 89 patients (4.1%) underwent revision AC joint reconstruction. Patients in the 10 to 29 age group were significantly less likely to undergo revision (19 of 701, 2.7%) when compared to 30 to 49 (p=0.02) and 50 to 69 (p=0.05) year olds. There was no difference in revision rate between 30 to 49 (49 of 989, 5.0%) and 50 to 69 (23 of 465, 5.0%). There was no statistical difference in revision rate between those with and without graft (4.0% vs 4.2%, respectively). 26 patients (1.2%) underwent one of the CPT codes representing surgical treatment for infection within 30 days of the initial operation.

Conclusion This large database study found a low early revision rate for AC joint reconstruction of 4.1%, with young patients being significantly less likely to undergo revision surgery. Sex and use of graft did not affect the revision rate. Infection requiring surgical intervention was also low in this population (1.2%), but was not affected by age, sex, use of graft or geographic location.

Notes:

9:03am – 9:07am

Natural History of Isolated Greater Tuberosity Fractures — An MRI Cohort

Christopher Langhammer, MD, PhD
Brian T. Feeley, MD

Introduction: With advances in procedural treatment for greater tuberosity (GT) fractures, selection of treatment modality depends on having a full understanding this injury's bony and soft tissue components and its natural history. We describe herein the patterns of soft tissue injury in isolated greater tuberosity fractures, and the natural history of these injuries, in a cohort of 39 patients.

Methods: Medical records from 8/2010 to 8/2014 for patients with a diagnosis of proximal humerus fracture and who also had an MRI of the affected shoulder were reviewed. Demographic data and clinical time course including injury morphology, treatment, and outcome was collected.

Results: There were 107 patients with proximal humerus fractures and MRIs identified. 41 of these patients had isolated greater tuberosity fractures, and 39 of them had documentation and radiography available for review. Overall there were 27 patients who had full, uncomplicated recovery (69% of the population). These patients were an average of 44 years old with average displacement of 2.5mm and average follow-up length of 101 days. The 12 patients experiencing complicated recovery (as defined by having symptoms which motivated procedural management or as having persistent symptoms at the study conclusion), were an average age of 55 with average displacement of 4.3mm and average follow-up length of 362 days.

Discussion: Understanding the anatomic nature of GT fractures and their natural history will help clinicians manage these injuries in a cost effective fashion, and assist them in providing prognostic information to patients. Demographics and injury morphology, for example, differ between rapid and prolonged recovery groups. The addition of soft tissue injury characteristics as made available through acute-phase MRI may play a role in providing prognostic information even if it isn't explicitly used to guide treatment.

Notes:

9:15am – 9:19am

Progenitor Cells Diminish Fatty Degeneration in Rotator Cuff Tear Model

Claire D. Eliasberg, BA
Tomasz J. Kowalski, MD, PhD
Cameron A. Garagozlo
Kyle M. Natsuhara, BS
Owen J. McBride, BS
Frank A. Petrigliano, MD

Introduction: Rotator cuff tears (RCTs) are a common cause of shoulder pain, and rotator cuff repair is the most common shoulder surgery. Muscle changes – including atrophy, fibrosis, and fatty degeneration – can develop following RCTs and may compromise surgical repair and clinical outcomes. Mesenchymal stem cells (MSCs) derived from the vascular fraction of adipose tissue have demonstrated myogenic and angiogenic potential in models of muscle injury. We hypothesized that the administration of MSCs may diminish fatty degeneration in a mouse model of massive RCTs.

Methods: 54 mice with severe combined immunodeficiency were used (9 groups, n=6) for this study. One group underwent sham surgery with a saline injection into the supraspinatus muscle at the time of surgery. The remaining 8 groups underwent one of two surgeries: supraspinatus and infraspinatus tendon transection (TT) or supraspinatus and infraspinatus tendon transection with suprascapular nerve denervation (TT+DN). MSCs were harvested from human lipoaspirate and sorted into two populations: pericytes and adventitial cells. At the time of surgery, each surgical group received one of four treatments: no injection, saline injection, pericyte injection or adventitial cell injection into the supraspinatus. At 6 weeks, muscle atrophy was assessed by measuring percent change in muscle weight. Muscle fiber cross-sectional area, fibrosis, and fatty degeneration were evaluated histologically.

Results: Mice that underwent TT and received injections of pericytes or adventitial cells had less weight loss and less fatty degeneration than their respective control groups. There were no differences in weight loss or fatty degenerationamongst the TT+DN groups. Mice that underwent TT+DN with pericyte injections had less fibrosis than respective controls. There were no differences in fibrosisamongst the TT groups.

Discussion and Conclusion: Our results suggest that administration of MSCs may have potential in the prevention of muscle atrophy, fatty degeneration, and fibrosis in the setting of massive RCTs.

Notes:

9:19am – 9:23am

Distal Tibia Radius of Curvature: Does It Match Shoulder Anatomy?

Michael Decker, MD
Gregory Strohmeyer, MD
Jeffrey Wood, MD
Gary Hatch, MD
Clifford Qualls, PhD
Gehron Treme, MD
Eric Benson, MD

Introduction: Anterior recurrent shoulder instability associated with a glenoid bony defect greater than 20-25% requires surgical stabilization with bony augmentation. Distal tibia osteochondral allograft is one graft option because the distal tibia may have a similar radius of curvature (ROC) compared to the glenoid and to the humeral head. The purpose of this study was to evaluate the ROC mismatch measured on CT scans between the glenoid, distal tibia, and humeral head.

Methods: Using specific exclusion and inclusion criteria, ten decedents from the Office of the Medical Investigator database were identified. Bilateral CT images of each decedent were formatted using standardized methods, giving twenty specimens for each of the three anatomic locations. Two readers performed repeat measurements of the ROC of the glenoid, distal tibia, and humeral head specimens on two separate occasions. To mimic the clinical setting, we generated a model to randomly assign the distal tibia specimens to the glenoids and repeated this randomization fifty times.

Results: The mean (SD) ROC was 2.9 cm (0.25) for the glenoid, 2.3 cm (0.21) for the distal tibia, and 2.5 cm (0.12) for the proximal humerus, with no statistically significant difference with regard to laterality and with good intraobserver and interobserver reliability. The mean difference in ROC between the glenoid and tibia was .57 cm, the glenoid and humerus was .40 cm, and the humerus and tibia was .17 cm.

Discussion and Conclusion: In this study, the ROC measurements of the glenoid, distal tibia, and humeral head are reliable and correlate with previous cadaveric measurements. There is approximately a 22% chance that a randomly selected distal tibia allograft will have a ROC within .3 cm of a given glenoid. It may be useful to obtain ROC measurements of an allograft specimen prior to use for glenoid reconstruction.

Notes:

9:23am – 9:27am

Risk of Nerve Injury During Total Shoulder Arthroplasty: Neuromonitoring Study

Robert L. Parisien, MD
Paul H. Yi, MD
Xinning Li, MD
Andrew Jawa, MD

Introduction: Reverse total shoulder arthroplasty (RSA) may have a greater risk of intra-operative nerve injury compared to anatomical total shoulder arthroplasty (TSA). The purpose of this study was to compare the incidence, pattern and predisposing risk factors for peripheral nerve injuries between RSA and TSA using intra-operative neuromonitoring and postoperative clinical correlation.

Methods: Thirty-six consecutive (12 RSA, 24 TSA) patients were included in this study. Neurological function was assessed preoperatively, intra-operatively, and at clinical follow-up visits. Intra-operative nerve monitoring was recorded using trans-cranial electrical motor evoked potentials (MEPs) and somatosensory evoked potentials (SSEPs). Each procedure was divided into 4 stages. Demographic data and predisposing patient factors were statistically analyzed.

Results: The total number of nerve alerts was not significantly different between the groups, however, there were nearly 5 times as many post-reduction nerve alerts per patient in the RSA cohort (2.17 vs. 0.46). Overall, the most common nerve alerts recorded were axillary (27%), radial (20%), and combined nerves (16%). The majority of alerts occurring during preparation of the humerus (33%) or glenoid (31%). There were 17 unresolved nerve alerts post-operatively with only 2 clinically detectable nerve injuries with both fully resolving by 6 months. Pre-operative decrease in passive forward flexion (FF) along with the diagnosis of rotator cuff arthropathy (RCA) were independent risk predictors**.**

Discussion and Conclusion: More intra-operative nerve alerts were detected in the RSA group during the post-reduction stage. This may be attributed to arm lengthening causing increased tension on the brachial plexus. A diagnosis of RCA and limited passive preoperative range of motion (FF) were independent risk factors for increased intra-operative nerve alerts. The clinical utility of intra-operative nerve monitoring and the relationship to nerve injury is questionable given the high degree of false-positives and lack of persistent post-operative clinical neurologic deficits.

Notes:

2015 Scientific Program Abstracts — Saturday

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

Saturday, August 1, 2015

General Session 9 — WOA/OREF Young Investigator Awards
"Smooth Operator" – Sade (1984)

Moderator: Geoffrey D. Abrahms, MD

7:00am – 7:06am

Treatment and Post-Surgery Functional Outcome of Spaghetti Wrist

Hamed Yazdanshenas, MD
Arya Nick Shamie, MD
Kodi K. Azari, MD, FACS

Introduction: The outcomes of treating sever wrist injuries are not well understood and despite its high prevalence particularlyamong young adults, spaghetti wrist is rarely investigated. The aim of this study is to evaluate the post-surgery functional outcome of spaghetti wrist.

Material and Methods: In this retrospective cross-sectional study, medical charts of 493 patients with tendon and nerve lacerations with or without vascular injuries were reviewed. Following the review, 153 patients with spaghetti wrist were followed for approximately 24 months.

Results: The review resulted in 137 male and 16 female participants. The mean age of the sample size was 28.3 years. The most common cause of injury was glass-window panes and bottles. Moreover, the most commonly involved structures were Flexor Digitorum Superficialis 3, 4 and 5. During the follow-up, the tendon functionality in 120 (78%), opposition in 115 (75.1%), and intrinsic in 62 (40.5%) were "excellent". Hand sensation was "fair" in 75 patients (49.1%), "good" in 46 patients (30%), and "excellent" in 28 patients (18.3%). The average return time to daily living activities was 10 months.

Discussion and Conclusion: This study showed that spaghetti wrist injuries among those who were older and suffered from higher number of damaged structures (especially nerve) have had poorer post-surgery functional outcomes. Therefore, more high quality studies are required to factor in the role of age, degree of injury, nerve injury, and time lapse from injury to repair among spaghetti wrist injuries.

Notes:

7:06am – 7:12am

Use of a Defined Surgical Approach in the Debridement Open Tibia Fractures

Geoffrey Marecek, MD
Luke Nicholson, MD
Richard L. Auran, BS

Introduction: The role of operative debridement in the prevention of infection after open fracture is well-established. This typically occurs by extension of the traumatic wound to expose the entire zone of injury, which allows identification and debridement of all non-viable tissues,. However, particularly with wounds over the medial face of the tibia, wound extension may prevent closure and result in the need for flap coverage. The use of a defined surgical approach has been proposed to minimize soft-tissue associated complications. However, the effectiveness and safety of this technique have not been reported. In this study, the authors hypothesize that a defined approach to open tibia fracture debridement results in a lower incidence of subsequent return to operating room and need for flap coverage.

Methods: All patients with open tibia fractures at our institution were prospectively enrolled in the study. The method of debridement was at the discretion of the treating surgeon and consisted of extension of the traumatic wound or the use of

a separate, defined approach. The anterolateral approach to the tibia was used in all cases. Patients underwent fracture fixation with either medullary nailing, internal fixation, or external fixation per surgeon discretion. Wounds amenable to primary closure were closed during the index procedure while non-closeable wounds were treated with negative pressure wound therapy or antibiotic-impregnated bead pouch. Subsequent debridements were carried out until traumatic wounds were either amenable to primary closure or flap coverage was performed.

Results: Seventeen patients with eighteen open tibia fractures were enrolled over a 6 month period. Mean overall OTA open fracture score was 7.4. There were 1 Type I, 7 Type II and 6 Type IIIA, 4 Type IIIB, and 0 Type IIIC according to the Gustilo- Anderson classification. During the index procedure, twelve patients were treated with an extension of the traumatic wound (direct extension group) while six patients underwent debridement through a defined approach (defined approach group). The mean OTA open fracture score was 7.67 in the direct extension group and 6.20 in the defined approach group. The groups had similar proportions of Gustilo-Anderson fracture types. The average number of surgeries, including index procedure, per patient was 2.0 in the direct extension group and 1.2 in the defined approach group. Flap coverage was needed in four patients in the direct extension group and no patients in the definitive approach group. Three rotational soleus and one free latissimus flaps were performed. Each required split thickness skin grafting. There were no reported infections.

Discussion and Conclusion: A defined surgical approach to the debridement of open tibia fractures is safe and may reduce the need for flap coverage in select patients.

Notes:

7:12am – 7:18am

Sacral Dysmorphism in Patients with Spinopelvic Dissociation

Anna N. Miller, MD
*Milton "Chip" Routt Jr., MD
Jonathan C. Barnwell, MD

Introduction: Spinopelvic dissociation is a traumatic injury that separates the axial skeleton from the pelvis via multiplanar sacral fractures. Sacral dysmorphism describes a type of sacral shape with iliac crest colinearity, lumbosacral discs, mammillary bodies, misshapen neural foramina, acute sacral alar slopes, and "tongue-in-groove" sacroiliac joints. Sacral dysmorphism is present in almost half of the adult population. Because of the characteristic upsloping ala and based on our anecdotal experience, we hypothesized that patients with dysmorphic sacra would be protected against the forces causing spinopelvic dissociation, and that incidence of dysmorphism would be much lower in this population than the general population.

Methods: Consecutive adult patients presenting to our Level I trauma center with sacral and pelvic fractures (OTA 61-A, B, C) were identified from 2000-2012 (1,050 consecutive patients). All imaging was reviewed, including sagittal CT for accurate diagnosis of spinopelvic dissociation. All patients with spinopelvic dissociation were included in this study.

Results: Twenty-five patients with spinopelvic dissociation were identified from the 1,050 total patients. Patients with spinopelvic dissociation had a mean age of 41.2±22.7 years. There were thirteen males and twelve females. Mean BMI was 24.5±5.2. The most common mechanisms of injury included motor vehicle collision and fall. The median injury severity score (ISS) in this group was 24.2±11.6. Only three patients (12%) were noted to have dysmorphic sacra.

Discussion and Conclusion: Only 12% of patients with spinopelvic dissociation have evidence of sacral dysmorphism. This is in contrast with the dysmorphism rate of 44% in the average adult population. This lower incidence suggests that variation in the osseous anatomy of the sacrum changes the force transmission across the sacrum during traumatic loading, protecting against certain axial-loading fracture patterns. Evaluating dysmorphism is critical for establishing the safe iliosacral screw placement zones, and understanding pathomechanics of sacral trauma.

Notes:

7:18am – 7:24am

The Hyperextension Varus Bicondlyar Tibial Plateau Fracture

Reza Firoozabadi, MD, MA
Jason Schneidkraut, MD
Daphne Beingessner, MD
Robert Dunbar, MD
David Barei, MD

Purpose: Classification systems used to identify tibial plateau fracture have been developed to help recognize common injury patterns and help guide treatment as well provide a means to perform research. The authors have identified a certain subset of tibial plateau fractures- hyperextension varus bicondylar tibial plateau fractures. The purpose of this study is to describe this fracture pattern, to delineate its associated injuries & to suggest treatment strategies that may allow for improved reduction and stabilization.

Methods: A retrospective review of prospectively gathered data at a regional Level I orthopaedic trauma center was performed to identify patients that had bicondylar tibial plateau fractures (OTA 41C). Preoperative radiographs and CT scans were reviewed to identify patients sustaining bicondylar tibial plateau fractures with combined hyperextension and varus displacement patterns. Specifically, sagittal plane imaging was assessed for osseous compression failure of the proximal tibia anteriorly and tension failure posteriorly, with loss of normal posterior slope of the proximal tibial articular surface. Coronal plane imaging was assessed for a medial articular injury and an apex lateral or varus coronal plane deformity. Patients were included if they had the above stated deformity on both planes.

Results: 212 bicondylar tibial plateau fractures were identified in 208 patients during the study period (5/2000-8/2010). Twenty-five fractures in 23 patients satisfied the radiographic criteria described above and formed the study population, with an average age of 58 years. The remaining185 patients with 187 fractures who had non-varus hyperextension bicondylar tibial plateau fractures had an average age of 41 years old. Mechanisms of injury included: 6 falls from standing, 5 falls from height, 11involved motorized vehicles. Three patients were lost to follow up. Thirty-two percent of the fractures (8/25) demonstrated significant associated injuries. Three patients (12%) had a popliteal artery disruption that required repair. Four patients (16%) had an either partial or complete peroneal nerve injury. Three patients (12%) developed leg compartmental syndrome which required emergent four-compartment fasciotomies.

Conclusion: The hyperextension varus bicondylar tibial plateau is a unique fracture. Low energy trauma can cause this fracture pattern and the associated injuries can be devastating. Specifically, the relatively high rate of popliteal artery disruption which can result in limb loss if not identified.

Notes:

7:24am – 7:30am

Comparison of "Ideal" Implant Placement and Clinical Implant Placement of Glenoid Component in Shoulder Arthroplasty

Emilie V. Cheung, MD
Matthew A. Hamilton, PhD
Lisa Becks, BS
Paul Saadi, MD
Richard Jones, MD

The focus of this study is to quantify how well a surgeon can identify the neutral axis of the scapula in a series of cadaveric shoulders, and determine how the surgeon identifies their ideal implant placement for the patient based on reconstruction of the entire scapula. The results showed the cadaveric assessment of center was shifted 1.69mm anterior and 1.99mm superior of the geometric center. The neutral axis was 11.8° retroverted and 14.2° superior of Friedman axis. The

significance of this study is to help establish a baseline for unguided surgical accuracy and identify the factors that are critical when placing implants intraoperatively.

Notes:

Saturday, August 1, 2015

General Session 10 — WOA Resident Awards
"Like a Surgeon" – Weird Al Yankovich (1985)

Moderator: William C. McMaster, MD

7:35am – 7:41am

Biomechanical Stability of Glenohumeral Bipolar Bone Lesions After Soft-Tissue Repair

Christopher Bui, MD
Robert U. Hartzler, MD, MS
Woong K. Jeong, MD
Masaki Akeda, MD
Alexander B. Peterson, BA
Stephen S. Burkhart, MD
Thay Q. Lee

Introduction: The "glenoid track" concept provides a model of the interplay between bipolar bone lesions in anterior shoulder instability, where "on-track" lesions and "off-track" lesions are non-engaging and engaging, respectively. Though not yet validated, the glenoid track concept allows for the proposal of a classification system and treatment paradigm for anterior shoulder instability. Arthroscopic soft tissue repairs (Bankart repair and/or remplissage) are contraindicated when there is a glenoid defect of greater than 25%. However, the ability of soft tissue repairs to appropriately restore shoulder stability when there is bipolar bone loss with glenoid lesions that are less than 25% remains unclear. The purpose of this study was to validate the "glenoid track" concept in a cadaveric bipolar bone loss model and to test whether "on-track" and "off-track" lesions can be adequately stabilized with Bankart or remplissage repair techniques.

Methods: Eight fresh-frozen cadaveric shoulders were tested in a custom shoulder rig with passive axial rotation and then progressive translational loading (10-40N). The injury conditions included glenoid bone loss of 15% with "on-track" (15%) and "off-track" (30%) Hill-Sachs lesions, and repair conditions included Bankart repair with suture anchors with and without remplissage.

Results: For on-track lesions, engagement was rare and stability was adequately restored with Bankart repair alone. For off-track lesions, engagement was routine and the addition of remplissage to the Bankart repair was necessary to restore biomechanical stability.

Discussion and Conclusions: The glenoid track concept is supported by this model of two Hill-Sachs lesions with 15% glenoid bone loss. Our results support the paradigm of Bankart repair alone for "on-track" lesions and Bankart repair plus remplissage for "off-track" lesions when moderate glenoid bone loss is present.

Notes:

7:41am – 7:47am

Static Spacers for Periprosthetic Knee Infection: Inferior Flexion to Articulating Spacers?

Paul M. Lichstein, MD
James I. Huddleston III, MD
Stuart B. Goodman, MD, PhD
William J. Maloney III, MD
Sharlene Su, BS
Gina Suh, MD
Hakan Hedlund, MD, PhD

Introduction: Two-stage exchange arthroplasty is the gold standard for treating total knee arthroplasty (TKA) periprosthetic joint infection (PJI) in the United States. Emerging data

suggest that articulating spacers offer comparable rates of infection eradication, improved postoperative flexion, and easier surgical exposure when compared to static spacers, albeit at a higher cost and complexity. In this study we compared the results of a two-stage protocol with static spacers to historical controls with articulating spacers.

Methods: We conducted a retrospective review of all 107 patients (109 knees, 53 males and 54 females) with minimum two years follow-up undergoing two-stage exchange for PJI at our institution from 1999 – 2011. Median age at the time of reimplantation was 67 years (range 42-89). Median body mass index was 29.15 kg/m2 (range 19.5-55.5 kg/m2). The Musculoskeletal Infection Society (MSIS) definition for PJI was utilized. Range of motion was measured by an independent physical therapist with a standard goniometer. ROM and cure rates were compared to those of the recent MSIS meta-analyses.

Results: Postoperatively, 67 of 109 knees had full extension and no patients had a flexion contracture >10°. Median flexion was 100° (range, 60-139°). Thirty-nine knees had postoperative flexion >120°. No patients received suppressive antibiotics postoperatively. 94% of patients were cured clinically at last follow-up. Staph and strep species were the most common organisms isolated. 24.8% of the organisms isolated at stage 1 were resistant to methicillin and/or vancomycin.

Conclusion: Our two-stage exchange protocol with static spacers yielded comparable flexion and cure rates when compared to historical controls using articulating spacers. The large proportion of resistant organisms is alarming.

Notes:

7:47am – 7:53am

A Novel Antibiotic Coating in Preventing Periprosthetic Infection

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

Introduction: Postoperative infection is a devastating complication following arthroplasty, leading to multiple revision surgeries, prolonged antibiotic use, significant disability, and increased morbidity/mortality. Aseptic surgical technique and intravenous antibiotics remain the standard of care in preventing such infections, despite decades of attempts at altering the local surgical environment. This is attributed to the inability to overcome the fundamental challenges of local delivery of antimicrobial agents in the setting of arthroplasty. The purpose of this study is to 1) introduce a "smart" delivery system that releases antibiotics through an active mechanism in response to the presence of bacteria and 2) use an established in vivo mouse model of post-arthroplasty infection to evaluate the efficacy of this polymer implant coating in preventing infection postoperatively.

Methods: A novel polymer coating using a poly(ethylene glycol) -propylene sulfide polymer (PEG-PPS) coating was designed to combine passive antibiotic release to the local microenvironment with an active release mechanism in which reactive oxygen species created by the presence of infection encourage additional local release of antibiotic. In vitro release kinetics were studied using high-performance liquid chromatography quantification. In vivo testing was performed by randomizing mice to a survival surgery with a novel (PEG-PPS), Vancomycin-PEG-PPS (Vanc), or Tigecycline-PEG-PPS (Tig) coated implant placed in a retrograde fashion into the femur. The joint was inoculated with 1 x 103 colony forming units (CFU) of a bioluminescent strain of S. aureus. Bacterial burden was then tracked longitudinally with quantitative bioluminescence imaging at postoperative day (POD) 0, 1, 3, 5, 7, 10, 14, and 21. The implants and surrounding tissue were extracted on POD 21 and cultured. Additionally, implants were imaged using variable-pressure scanning electron microscopy (VP-SEM) to evaluate biofilm formation.

Results: There was a lower bacterial signal for both the Vanc and Tig groups when compared to the PEG-PPS control group. This difference was significant for the Tig group on days 1, 3, 5, 7, 10, and 14 and for the Vanc group on imaging days 1, 3, 5, and 7. POD21 implant cultures showed a 29-fold greater number of CFU from the PEG-PPS vs Vanc group. Additionally 0 CFU were cultured from the Tig group. Tissue cultures showed a 50-fold greater number of bacteria in the PEG-PPS group vs Tig group and 1.37 fold greater number of CFU from the PEG-PPS vs Vanc groups. VP-SEM imaging showed evidence of more substantial biofilm formation in the PEG-PPS group in comparison to the Tig and Vanc groups.

Discussion and Conclusion: Antibiotic linked implant coatings such as the one tested in this study provide a very promising approach to preventing periprosthetic infection. Further studies in larger animals and eventually human subjects are needed.

Notes:

7:53am – 7:59am

Radiographic Predictors of Posterior Wall Fracture Instability

Calvin Schlepp, MD
Clay Spitler, MD
Ben Hamilton, BS
Milton "Chip" Routt Jr., MD
Paul Tornetta, MD
Reza Firoozabadi, MD, MA

Introduction: Fractures of the posterior wall of the acetabulum are the most common injuries to the hip socket, comprising 20% to 30% of all acetabular fractures. Non-operative management of these injuries is supported when the hip is stable and congruent. Traditionally, the size of the posterior wall fragment has been used to predict stability and indicate operative fixation but a large indeterminate range exist as currently measured. This study evaluated additional fracture characteristics including femoral head coverage, acetabular version, history of dislocation, and fracture location, in addition to fragment size, to evaluate predictors of posterior wall instability.

Methods: 138 isolated posterior wall fractures were retrospectively reviewed in patients that underwent fluoroscopic dynamic stress examination under anesthesia. Radiographic measurements were performed on CT and plain film images and an examination under anesthesia served as a standard to compare stable versus unstable hips.

Results: Examination under anesthesia determined 116 hips to be stable and 22 hips as unstable. Moed and Keith method of wall size measurements and cranial exit point of fracture was statistically different between stable and unstable hips. Twenty-three percent of the unstable hips had wall sizes less than 20%. Average cranial exit point of fracture from dome was 5.0 mm in the unstable group and 9.5 mm in the stable group and fractures that extend into the dome were statistically more likely to be unstable.

Discussion and Conclusion: Determination of hip stability can be challenging in patients with posterior wall acetabular fractures. Our data suggest that the location of the exit point of the fracture in relation to the dome of the acetabulum is a radiographic marker that can be utilized to aid physician in determining stability and wall sizes less than 20% is not a reliable indicator of stability.

Notes:

7:59am – 8:05am

The Effect of RhBMP-2 in a Novel, Non-Instrumented Extremity Nonunion Model

Jason H. Ghodasra, MD, MSCI
Brian M. Weatherford, MD
Michael S. Nickoli, MD
Erika L. Daley, MD
Erin L. Hsu, PhD
Wellington K. Hsu, MD

Introduction: Pre-clinical models of bony nonunion typically employ critical-length defects. However, these models may not accurately reflect clinical practice since many nonunions are diagnosed without bone loss. We developed a non-displaced rat ulna fracture model in order to examine the efficacy of recombinant human bone morphogenetic protein-2

(rhBMP-2) with an absorbable collagen sponge (ACS) for nonunion treatment.

Methods: Transverse diaphyseal ulna fractures were created in 24 Sprague-Dawley rats. Eight animals (Group 1: Nonunion) received no further intervention. The remaining 16 animals were treated with 5µg rhBMP-2/ACS at 8 weeks after the original intervention (Group 2: Nonunion + BMP) or at the time of initial injury (Group 3: Fresh fracture + BMP).

Results: In Group 1, 7 of 8 fractures demonstrated gross motion and a persistent radiographic gap (12.5% healing rate). In Groups 2 and 3, fractures healed at a rate of 75% (6 of 8) as determined by manual and radiographic evaluation. Biomechanical testing for torque load-to-failure and torsional stiffness demonstrated no significant difference between healed specimens treated with rhBMP-2.

Discussion and Conclusion: To our knowledge, this is the first description of a physiologic, non-stabilized, non-defect fracture nonunion model in a rodent. Furthermore, unlike previous nonunion models, the healing rates after treatment with rhBMP-2 are comparable to that of clinical data, suggesting that this model may provide an environment more representative of nonunions in humans.

Notes:

8:05am – 8:11am

Fresh Osteochondral Allograft versus Autograft: 12 Month Results in Isolated Canine Knee Defects

Ryan Fader, MD
Eric C. McCarty, MD
Edward Glenn, MD
Hollis G. Potter, MD
Stephanie Ho, MD
Kurt Spindler, MD
Justin Mitchell, MD

Introduction: Osteochondral autografts and allografts have been widely used in the treatment of isolated Grade IV articular cartilage lesions of the knee. Currently, there is paucity in the literature with regards to the basic science investigating the direct comparison between fresh osteochondral allografts to autografts. It is our belief that at twelve months after surgery, fresh osteochondral allografts are equal to autografts with respect to function, bony incorporation into host bone and chondrocyte viability.

Methods: Eight adult mongrel dogs underwent bilateral hind limb osteochondral graft implantation in the knee after creation of an Outerbridge Grade IV cartilage defect. One hind limb knee received an autograft, and the contralateral knee received an allograft. All dogs were sacrificed at twelve months. Graft analysis included gross examination, radiographs, magnetic resonance imaging, biomechanical testing and histology.

Results: Magnetic resonance imaging demonstrated excellent bony incorporation of both autografts and allografts, albeit one graft (allograft) which revealed partial incorporation. Histologic examination showed normal cartilage structure for autografts and allografts alike.

Discussion and Conclusion: After 12 months from time of implantation, fresh osteochondral allograft and autograft tissue are not statistically different with respect to biomechanical properties, bony incorporation and chondrocyte viability. The use of allograft tissue to treat osteochondral defects eliminates the morbidity associated with harvesting autograft tissue without compromising the results of the surgical procedure.

Notes:

8:11am – 8:17am

What Is the Most Effective Technique to Stabilize Patients on the Operating Table During Total Hip Arthroplasty?

Pascual Dutton, MD
Katrina Tech, BS
Jeremi Leasure, MS
William McGann, MD
Edward N. DeMayo, MD

Introduction: Total hip arthroplasty (THA) surgery is an effective orthopaedic procedure that can relieve pain and

improve function in patients. However, appropriate component positioning is paramount in determining the long-term success of the procedure as well as avoiding the risks associated with a revision surgery. Several of the critical steps in THA are forceful maneuvers that can shift the patient from their original position making component positioning more difficult. The goal of this study was to compare pelvic stability during THA using four common positioners.

Methods: Bilateral THA was performed on 1 cadaver using four hip positioners. The first positioner (Beanbag) consisted of an air-tight bladder filled with plastic beads that can be vacuum sealed into a rigid form. The second and third designs (Padded A and B) consisted of adjustable pads that are secured to the operating table and are positioned against the pelvis and lower back. The fourth design (Pegboard) consisted of a plastic pegboard and vertical metal dowels that are again placed against pelvis and lower back for stability. The motion of the pelvis during critical steps (dislocation, retraction, reaming, and cup insertion) was measured using an infrared tracking system.

Results: The Padded A design resulted in the least pelvic movement during THA. Relative to the Padded A design, the Padded B showed a 2.7-fold increase, the Pegboard showed 3.3-fold increase, and the Beanbag showed a 6.1-fold increase in pelvic movement.

Discussion and Conclusion: The goal of our study was to investigate if there was a measurable difference in intraoperative pelvic motion when comparing four commonly utilized hip positioners. During dislocation, retraction, reaming, and cup insertion, the Padded A hip positioner allowed the least amount of pelvic movement. Our results indicate the use of the adjustable pad hip positioner may reduce the risk of possible complications associated with component malposition during THA.

Notes:

Saturday, August 1, 2015

Rapid Fire Session 13A — Orthopaedic Imaging

Moderator: Major Seth McCord, MD

12:55pm – 12:59pm

The Sourcil Sector Angle: New Radiographic Sign of Acetabular Dysplasia

Stephanie Pun, MD
Philipp Leucht, MD, PhD
Michael Bellino, MD

Introduction: Acetabular dysplasia is characterized by mechanical instability and static overload, leading to degeneration of the hip joint. Although both acetabular and femoral head sizes affect the articulation's surface area and dynamic stability of the hip, current radiographic diagnostic criteria only focus on acetabular shape. The purpose of this study was to develop a new, reliable, diagnostic radiographic measurement of acetabular dysplasia that accounts for both acetabular and femoral head sizes.

Methods: IRB approval was obtained to retrospectively review AP pelvis XR's of 41 skeletally mature hips with symptomatic acetabular dysplasia, and 41 pelvic CT scans of age, gender, and laterality-matched asymptomatic control hips. Two independent observers on two occasions measured lateral center edge angle (LCEA), sourcil length, femoral head diameter, and sourcil sector angle (SSA). SSA was defined as an angle formed between two lines from the center of the femoral head to the medial and lateral extents of the acetabular sourcil. The two groups were compared using paired student's t-test and ANOVA with a 5% margin, and inter- and intra-observer reliability were assessed with Pearson correlation.

Results: Dysplastic hips had significantly smaller sourcil lengths relative to femoral head diameter, which were reflected in significantly lower SSA measurements in dysplastic hips (55.85°±7.77) than in control hips (70.38°±7.84). SSA demonstrated excellent intra-observer (r = 0.90) and inter-observer (r = 0.82) reliability, and significantly smaller measurement variance (SD = 7.77) than LCEA (SD = 9.39).

Discussion and Conclusion: The SSA is a reliable and easily reproduced, single radiographic measurement that reflects in dysplastic hips the smaller size ratio between the acetabular sourcil and femoral head. The SSA is consistently decreased

in acetabular dysplasia and may serve as a useful marker to predict dynamic instability of the hip in the diagnosis of acetabular dysplasia.

Notes:

12:59pm – 1:03pm

ACL Tear and Posterior Inferior Tibial Slope: Age, Gender, Race

Alana L. Waiwaiole, BS
Ajay Gurbani, MD
Kambiz Motamedi, MD
Leanne Seeger, MD
Myung Shin Sim
Patricia Nwajuaku, MD
Sharon L. Hame, MD

Introduction: Studies have implicated increased posterior inferior tibial slope (PITS) as a possible risk factor for ACL injury, though currently no consensus exists. While many studies used lateral radiograph to measure PITS, recent data has suggested that MRI is more accurate. In addition, patient demographics may impact the relationship between PITS and ACL injury. The purpose of this study is to investigate the association between race, gender and age with increased PITS and ACL injury.

Methods: Patients with an ACL tear who underwent a MRI at our institution from 1990-2009 were identified through billing records. One hundred and nine patients were included in the ACL deficient group (52 males (48%); mean age 27 years, range 13-58). One hundred and five case-matched ACL intact controls (43 males (41%); mean age 36, range 10-75) were identified. Medial and lateral PITS were measured from MRI using a previously reported technique. ANOVA, correlation and logistic regression models were conducted between the PITS, demographics and ACL injury.

Results: The ACL deficient patients had significantly higher values of lateral and medial PITS. There was a positive correlation between medial and lateral plateau. Multivariable logistic regression model demonstrated age and lateral PITS were significantly associated with ACL injury. For every unit increase in age, the odds of having an ACL injury is reduced 6%. As every unit of lateral PITS increased, the odds of having ACL injury is increased 12.4%. The medial PITS, gender and race did not show a significant association.

Conclusion: Increased lateral PITS is associated with increased risk of ACL injury. Increasing age significantly decreased the risk for ACL injury; however race and gender showed no significant difference in risk. In the future, lateral posterior inferior tibial slope may be used to identify patients at risk, particularly those with multiple injuries to the ACL.

Notes:

1:03pm – 1:07pm

Evaluating Pediatric Patellar Instability Using TT-PCL Distance

Blake C. Clifton, MD
*Michael Decker, MD
Dustin Richter, MD
Dan Tandberg, MD
Matthew P. Ferguson, MD
Gehron Treme, MD

Introduction: Current literature shows that the position of the tibia relative to the femur changes during flexion suggesting that the TT-TG distance varies as a function of knee flexion and may not be a reliable tool in the localization of the malformation and treatment of patellar instability. The objectives of this study were to confirm that Tibial Tubercle-Posterior Cruciate Ligament (TT-PCL) measurement in the pediatric population are reliable and reproducible, determine whether normal TT-PCL distance changes with age and progresses to a normal adult value at skeletal maturity, and compare TT-PCL distances in skeletally immature individuals with a pathologic TT-TG distance.

Methods: All knee MRIs performed for patients from birth to 15.9 years old that were available at our institution between December of 2004 and February of 2012 (total 566) were retrospectively collected. Eighty-two patients had patellar instability and 484 patients did not have patellar instability (control group). Two MRI readers measured TT-PCL distance on T2-weighted axial images according to the technique previously described. Intra- and Interobserver agreement was measured. The group difference between mean TT-PCL distances were evaluated using Student's t-test.

Results: Intra- and interobserver agreement were almost perfect (0.93) and substantial (0.80) respectively. The mean TT-PCL distance was 20 mm with a range of 5.8 mm to 32 mm. The mean age was 12.6 years with a range of 0.8 to 15.9 years. Eighty-two subjects had instability; 484 subjects did not. The average TT-PCL distance was 21 mm for the instability group and 19.9 mm for the control group. TT-PCL distance increased significantly as subject age increased however there was no significant measurement difference between the groups with or without patellar instability.

Discussion and Conclusion: TT-PCL distance changes with age in the pediatric population but is not a reliable measurement to use in the treatment of pediatric patellar instability.

Notes:

1:10pm – 1:14pm

Utility of Three-Dimensional Computed Tomography for the Surgical Management of Rib Fractures

Benjamin R. Pulley, MD
T. Ty Fowler, MD
Thai Q. Trinh, MD
Benjamin C. Taylor, MD

Introduction: Surgical stabilization of flail chest is increasingly recognized as a valid approach to improve pulmonary mechanics in selected trauma patients. The use of two-dimensional (2D) computed tomography (CT) has become almost universal in the assessment of blunt chest trauma and multiple rib fractures. We hypothesized that three-dimensional (3D) CT adds valuable information to the preoperative plan for fixation of rib fractures.

Methods: Utilizing a retrospective cohort of 50 consecutive adult patients with multiple rib fractures requiring surgery, we evaluated the intra- and inter-observer reliability of plain x-ray, 2D CT, and 3D CT for the identification of rib fractures and identified how often the surgical plan changed with the addition of the information provided by the 3D CT. Two fellowship-trained orthopaedic trauma surgeons who regularly operate on rib fractures in their clinical practice and were not involved in the treatment of the study population evaluated the radiographic data.

Results: Overall, 2D CT had the highest diagnostic accuracy for detecting rib fractures as compared to plain x-ray and 3D CT. Inter- and intra-observer reliability for 2D and 3D CT was excellent; it was substantial for plain x-ray. Importantly, 3D CT changed the surgical tactic in 65.7% of cases.

Conclusion: We conclude that 3D CT it is an important tool for preoperative planning of rib fracture fixation.

Notes:

1:14pm – 1:18pm

Why MRI Misses and How Might We Improve MR Interpretation?

John C. McConnell, MD

Introduction: Purpose: To identify certain conditions in the knee, shoulder, wrist and ankle which may be missed by MRI and suggest how MRI identification might be improved.

Methods: Between January 2010 and November 2014, 472 patients had arthroscopic confirmation of pathology predicted by pre-operative history and physical exam but missed or incompletely identified by "generic" MRIs. These included 262 knee cases with ACL dysfunction (due to partial ACL injuries), 193 shoulder cases with capsulolabral pathology (SLAP lesions and incomplete label lesions including Kim

lesions, "reverse Kim"/Stewart lesions), 9 wrist TFCC tears, and 8 ankle cases with laxity due to ATF and CF ligament injury).

Results: This study supports observations in radiology literature that: "There are several varieties of misses: lesions that are overlooked, lesions that are misinterpreted, and lesions that are difficult to see or not present on the images even in retrospect" and "these patients would have been treated conservatively (no surgery) on the basis of normal results of conventional MRI", and that MRI does not substitute for detailed history taking and physical examination, and that arthroscopy remains the "gold standard" as a diagnostic tool and may be the often the only diagnostic tool which can reliably document certain types of pathology. This study suggests that accuracy of interpretation of MRI at 1.5T can be improved by providing detailed specific prescription for MRI including detailed information on history of injury and physical findings which clearly identifies pathology anticipated and which specifies multiple thin slices in particular planes.

Conclusions: The problem of access to care or lack thereof on the basis of false-negative MRI is real and is supported in the literature and by this study Detailed prescription for MRI including detailed information on anticipated pathology based on history of injury and physical exam may improve accuracy of MRI interpretation.

Notes:

1:18pm – 1:22pm

Acute Versus Delayed MRI Imaging and Associated Pathology in Traumatic Shoulder Dislocations

Xinning Li, MD
Nathan Orvets, MD
Justin Chung, BS
Akira Murakami, MD

Introduction: Delayed management of patients with shoulder instability may increase the incidence of concomitant intra-articular shoulder injuries due to recurrent subluxations/dislocations. The purpose of this study is to evaluate whether patients who wait longer from an initial dislocation event to obtain an MRI will have more associated shoulder injuries and higher risk of recurrence postoperatively.

Methods: We performed a retrospective review of patients (N=89) with a traumatic shoulder dislocation at a single institution. Patients were divided into two groups: MRI less (N=44) or greater (N=45) than 6 months from initial dislocation event. A musculoskeletal radiologist and a fellowship-trained orthopaedic surgeon reviewed all MRI studies recording intra-articular shoulder injuries, cartilage loss, glenoid or humeral head bone loss, version and humeral head subluxation. Recurrence rate after surgery was also documented. Statistical analysis was performed.

Results: There were more associated SLAP tears (58% vs. 34%) and Posterior Labral tears (22% vs. 7%) in the greater than 6 Months (GT6) versus less than 6 months (LT6) group. Anterior glenoid bone loss was seen in 40% of patients in the GT6 months vs. 39% in the LT6 months group. Cartilage damage was seen in 73% of patients GT6 months vs. 27% of patients in LT6 months. Patients that had shoulder stabilization surgery within 6 months of the primary dislocation event had a zero percent of recurrence. Patients that had shoulder surgery greater than 6 months from the primary dislocation event had an 18% (6/33) recurrence rate.

Conclusion: Patients that waited more than 6 months from the time of primary shoulder dislocation to obtain an MRI may have an increased risk of SLAP tear, Posterior Labral tears and anterior glenoid cartilage damage. Additionally, risk of recurrence after shoulder stabilization surgery is significantly higher when the surgery is performed more than 6 months from the primary dislocation event.

Notes:

Saturday, August 1, 2015

Rapid Fire Session 13B — Hand, Wrist and Elbow

Moderator: Deana Mercer, MD

12:55pm – 12:59pm

Factors Affecting Appropriateness of Transfers for Hand Injuries

Djuro Petkovic, MD
D. Montri Wongworawat, MD
Scott R. Anderson, MD

Introduction: Transfers of patients for higher level of care has helped improve the care of patients with higher acuity of injuries since the enactment of EMTALA. However, an unintended consequence is the inappropriate transfers of patients who do not truly require transfer of care. We set out to identify factors associated with appropriateness of patient transfers.

Methods: We retrospectively reviewed the records of all patients transferred to our Level I Trauma Center for injuries distal to the ulnohumeral joint between April 1, 2013 and March 31, 2014; 213 patients were included in our study. We examined the records for appropriateness of transfer based on whether the patient required the attention of the receiving hospital's attending surgeon (appropriate transfer) or whether the junior-level resident treated the patient alone (inappropriate transfer). We performed logistic regression to identify factors associated with appropriateness of transfer. Potential factors were evaluated in a logistic regression model; these factors included: whether or not a specialist evaluated the patient prior to transfer, age, insurance status, race, injury type, sex, shift time, distance traveled, and median income.

Results: Only the factors of shift time and type of injury were associated with appropriate transfers. In particular, second shift (15:00 to 23:00) was associated with higher risk of inappropriate transfer (Beta -1.05). Injury type (amputations and open fractures) was associated with appropriate transfers (Beta 1.90 and 2.31, respectively), as these most often required attending physician attention. Interestingly, specialist evaluation prior to transfer was not significant.

Discussion and Conclusion: Second shift and type of injury (namely amputations and open fractures) were significant factors in the appropriateness of transfer. More patients are required to find an association between specialist evaluation and appropriateness of transfer. Future studies may focus on finding reasons and possibly aligning incentives to minimize inappropriate transfers and associated systems costs.

Notes:

12:59pm – 1:03pm

Clinical Outcomes of Single-Incision Suture Anchor Repair of Distal Biceps Tendon Rupture

John P. Dupaix, MD
Megan H. M. Kuba, MD
Robert Atkinson, MD
Daniel Singer, MD
Megan M. Chock, BA
Erin Napier

Introduction: Rupture of the distal biceps tendon remains a rare injury that is ideally treated by operative repair. Single incision anterior approach with suture anchor repair is one such method. The purpose of this study is to describe the outcome of patients who underwent repair of the distal biceps tendon with single anterior incision and suture anchor repair.

Methods: 119 patients (120 repairs) with distal biceps tendon repairs between January 1, 2002 and December 31, 2012 were identified and their charts retrospectively reviewed. 25 of these patients participated in additional collection of outcome data including ROM, strength, pain, satisfaction and clinical outcome.

Results: In the retrospective analysis the population was 93% male. Average age was 47.3 years; however, females had a significantly higher mean age. The majority of patients (69.8%) returned to full or partial work. The additional data collection cohort reported high satisfaction, little-to-no pain on VAS, and average DASH scores. Patients with workers' compensation claims reported significantly higher pain and worse DASH scores. There was small but significant loss

of pronation ROM, and a small loss of grip strength that approached significance.

Discussion and Conclusion: Single anterior incision with suture anchor repair may be utilized for repair of ruptures of the distal biceps tendon with good clinical and functional outcomes with minimal loss of range of motion and strength. Females tend to be older at presentation than men with this condition. As in other studies, workers' compensation claims are associated with poorer clinical outcomes.

Notes:

1:03pm – 1:07pm

Partial Trapeziectoy with Capsular Interposition for Thumb CMC Arthritis

Moheb S. Moneim, MD
Deana Mercer, MD
Christina Salas, PhD
Nathan Morrell, MD

Introduction: Limited excision of the base of the first metacarpal and the distal trapezium using the joint capsule as interposition can provide a stable thumb and is a viable alternative to complex surgical procedures.

Methods: 62 patients had surgery using this technique. Our study is a long term clinical evaluation of eligible patients with follow up between 27-77 months (average 51 months). The technique has 3 steps; using a dorsal approach the resection of the base of the first metacarpal and only the distal trapezium is followed by interposing the joint capsule in the created space and reefing of the periosteal flap elevated from the base of the first metacarpal. 23 patients were excluded because of inadequate preoperative evaluation. 39 patients remained for follow up. Of these 18 (46%) returned for examination.

Results: A statistically significant improvement was found when comparing the preoperative to the postoperative grip. DASH scores were at a median of 4.17.

Discussion: Our procedure is simple to perform, and results in a stable thumb and an excellent DASH score without the need for tendon or prosthetic interposition.

Notes:

1:10pm – 1:14 pm

Clinical Diagnosis of Coincident Carpal and Cubital Tunnel Syndromes

Justin Koh, MA
Kodi K. Azari, MD, FACS
Prosper Benhaim, MD

Introduction: Coincident ulnar compression at the cubital tunnel can affect patients with carpal tunnel syndrome, but poses a diagnostic challenge - sensitivity of "gold standard" nerve conduction study results is limited to 60-70%. To date, this coincidence has not yet been reported, and a better characterization of diagnostic methods may improve detection of coincident compression neuropathy.

Methods: A retrospective chart review of 515 patients was performed from patients treated for carpal tunnel and/or cubital tunnel release by two university-based hand surgeons. Cohorts included patients with isolated carpal tunnel syndrome (n=337) and patients with coincident carpal and cubital tunnel syndromes (n=178). Patients were characterized according to demographics, medical history, physical exam, and nerve conduction studies. Univariate and multivariate logistic regression identified predictors of coincident nerve compression. The "K-B score" was constructed by integerizing regression coefficients of predictive factors in the multiple regression model. Receiver operating characteristic curves were generated, after which sensitivities, specificities, positive, and negative predictive values were calculated for each score threshold to identify a cutoff value.

Results: Loss of intrinsic hand strength, ulnar sensation loss, positive elbow flexion test, positive cubital tunnel Tinel's sign, and abnormal ulnar nerve NCS result were selected. The

cutoff value was 2 points, with a sensitivity of 86.6% and a specificity of 86.5% in the developmental cohort. Area under the ROC curve was 0.9217.

Discussion and Conclusion: Given limited sensitivity of the NCS at the cubital tunnel, physical exam should weigh heavily in a diagnosis of coincident cubital tunnel syndrome in carpal tunnel syndrome patients - patients with a K-B score of 2 or greater should be carefully evaluated accordingly. In this developmental cohort, the score was a robust method for detecting coincident nerve compression using factors routinely utilized to assess compression neuropathy at the cubital tunnel.

Notes:

1:14pm – 1:18pm

Outcomes After Distal Radius Fracture Treatment with Percutaneous Wire Versus Plate Fixation: A Meta-Analysis of Randomized Controlled Trials

Mark Anderson, MD
Mark Ghamsary, PhD
P.T. Guillen, MD
D. Montri Wongworawat, MD

Introduction: There are multiple methods for surgical fixation of distal radius fractures including percutaneous pinning with Kirschner wires and open reduction volar plating. We present a meta-analysis of published randomized controlled trials comparing these two methods with regards to Disabilities Arm Shoulder Hand (DASH) scores, grip strength, wrist motion, radiographic parameters, and complications.

Methods: We followed Transparent Reporting of Systematic Reviews and Meta-Analyses (PRISMA) guidelines to identify and analyze eligible clinical trials with detailed extraction of data. Seven trials with a total of 859 patients were included in our review.

Results: For DASH scores, grip strength, ranges of motion, radiographic parameters, and complication risk, with the exception of superficial infection, neither pinning nor plating is favored in this meta-analysis. For superficial infection risk, plating was favored.

Discussion and Conclusion: Plate fixation of distal radius fractures is associated with less superficial infection risk when compared with wire fixation, although the risk of repeat surgery is not different. Functional outcomes including DASH scores are not different between techniques.

Notes:

1:18pm – 1:22 pm

Computer Assisted Surgical Planning for Distal Radius Malunion: A Randomized Controlled Trial

Natalie L. Leong, MD
Jesse B. Jupiter, MD
Geert Buijze, MD, PhD
Rodrigo Moreno, MD
Peter M. Axelsson, MD
Filip Stockmans, MD, PhD

Introduction: Surgical correction of distal radius malunion can be difficult due to the complex anatomy associated with this condition, and it has been shown that there is a correlation between the quality of anatomical correction and overall wrist function. Computer assisted surgical planning, combined with patient-specific surgical guides, has the potential to improve pre-operative understanding of patient anatomy as well as intra-operative accuracy. The objective of this prospective randomized controlled trial is to compare patient reported outcomes after corrective osteotomy for distal radius malunion with and without preoperative computer-assisted planning and peri-operative patient-specific surgical guides.

Methods: After obtaining all appropriate human subject approval and patient informed consent, patients with symptomatic distal radius malunion at four institutions were randomized into two groups. The control group underwent corrective osteotomy as usual. The computer-assisted surgical planning (CAS) group underwent bilateral forearm CT scans,

from which computer models were made. Then, software was used to determine the optimal osteotomy site and bony alignment. Three-dimensional printing was then used to create custom surgical guides for intraoperative use. For both groups, pre-operative and post-operative DASH scores, PRWE scores, pain, and satisfaction scores were analyzed.

Results: Patients with CAS had lower operative time and intraoperative fluoroscopy time as compared to controls. At 3 and 6 months postoperatively, subjects with CAS reported a greater improvement in DASH scores. Trends of greater improvement in pain and satisfaction scores were also observed in the CAS group at 3, 6, and 12 month follow up.

Discussion and Conclusion: Computer-assisted surgical planning for distal radius corrective osteotomy may help reduce operative time and fluoroscopy time. In addition, this technology may result in greater postoperative improvement of pain, satisfaction, and DASH scores in patients with distal radius malunion than conventional surgical methods.

Notes:

Saturday, August 1, 2015

Rapid Fire Session 13C — Knee

Moderator: Jeffrey M. Nakano, MD

12:55pm – 12:59pm

Pre-Operative Patient Recorded Outcome Measures Predict Patient Discharge Location Following UKA

Alfonso E. Ayala, BS
Kevin A. Lawson, MD
Michael P. Dohm, MD
Angelika Gruessner, PhD

Introduction: The incidence of UKA in the U.S. increased at triple the rate of TKA between 1998 and 2005. Advantages offered by UKA include decreased blood loss, decreased morbidity and faster recovery. Recently, there has been a move to evolve UKA as an outpatient procedure. Patients requiring extended post-operative care don't benefit from this aspect of UKA and may not be the best indicated candidates. The purpose of this article is to report pre-operative variables that predict higher likelihood of extended care following UKA.

Methods: A prospective cohort of 174 subjects and 234 knees was used to collect and analyze patient reported outcome measures (PROMs) using the SF36 form along with objective clinical data between 1997 and 2009. Univariate and multivariate analysis with backward elimination were conducted to identify a predictive model of discharge to skilled nursing facilities (SNFs) following UKA.

Results: Overall, 89.08% (n=155) of subjects were discharged home versus 10.92% (n=19) discharged to SNFs. Univariate analysis revealed that higher BMI (32.8 (±8.9)) and lower physical function (27 (±15.1)) were strongly related with discharge to SNFs. Multivariate analysis showed that obesity and bilateral UKA were predictive of discharge to SNFs (57.89% had BMI greater than 30 and 73.68% underwent bilateral UKA). Multivariate backward elimination yielded the best predictive model of discharge to SNFs (concordance 78.7%, C ROC value 0.791) consisting of age (in 10-year increments, odds ratio 4.18), bilateral UKA (odds ratio 1.887) and physical function (odds ratio 0.968).

Discussion and Conclusion: This study shows that 10-year increments in age quadruple likelihood of extended care, bilateral UKA doubles the likelihood, and unfavorable pre-operative PROMs (specifically physical function) increase the likelihood of extended care following UKA. These patients not likely to benefit from short-term advantages of UKA and may be better indicated for TKA.

Notes:

12:59pm – 1:03pm

Are Custom Cutting Guides Better for Total Knee Arthroplasty Patients?

John Heydemann, MD
*Gregory Catlett, MD
Richard Blalock, MD
Terry Clyburn, MD
Stephanie Logterman, BA
William McGarvey, MD

Introduction: The purpose of our study was to compare post-operative alignment in patients undergoing in total knee arthroplasty (TKA) using patient specific custom instruments or standard instrumentation.

Methods: The study group used computed tomographic (CT) guided alignment guides and the comparative model used intramedullary femoral guides and extra-medullary tibial guides. We compared post-operative mechanical axis, coronal femoral-tibial angle, coronal tibial angle, posterior slope, and patella tilt. We collected matched patients for each limb of our study and retrospectively analyzed the data.

Results: The CT guided group had 93 knees and the standard group had 74 knees. All measurements are mean values and range measured in degrees. Standard guide mechanical axis: 1.7 varus (7 valgus to 9.1 varus). Femoral-tibial angle: 3.6 valgus (2.5 varus to 12 valgus). Tibial angle: 1.4 varus (3 valgus to 4.4 varus). Tibial slope: 5.4 posterior slope (0.2 anterior slope to 10.8 posterior slope). Patellar tracking: 2.4 (0 to 13). CT cutting guide mechanical axis: 1.8 varus (5valgus to 13.3 varus). Femoral-tibial angle: 3.4 valgus (4.6 varus to 14.6 valgus). Coronal tibial angle: 1.6 varus (7.2 valgus to 7 varus). Tibial slope: 6.8, (1 anterior slope to 17.6 posterior slope). Patellar tracking: 2.1, (0 to 12.4). There was no significant difference in mechanical axis, coronal femoral-tibial angle coronal tibial angle or patellar tracking. There was a statistically significant difference found when comparing the groups tibial slope. When the 3 greatest outliers are removed from the CT cutting guide group there was no significant difference.

Discussion and Conclusion: We have identified that standard instrumentation proved to be as reliable as the custom guides regarding the mechanical axis, femoral-tibial angle, coronal tibial angle, and patellar tracking, in addition to tibial slope with the most extreme outliers removed.

Notes:

1:03pm – 1:07 pm

Dramatic Reduction in Blood Transfusions in THA and TKA Using ActiveCare + SFT and Tranexamic Acid

Joshua Campbell, MD
Zachary T. Sharfman, MS
Andrew Spitzer, MD

Introduction: Venous thromboembolic disease (VTED) following THA and TKA poses substantial risk. Pharmacologic prophylaxis against VTED is well recognized to cause bleeding, increase risk of transfusion, and associated complications. There is a portable, pneumatic sequential compression device synchronized to the respiratory cycle, providing equivalent VTED prophylaxis to pharmacologic agents without associated bleeding. There is also is an antifibrinolytic (TXA) which reduces blood loss following THA and TKA. Our objective was to determine the impact on blood transfusion of eliminating low molecular weight heparin, introducing the pneumatic sequential compression device and administering TXA during TKA and THA.

Methods: Three cohorts of THA and TKA patients were studied. All patients were asked to donate a single unit of autologous blood preoperatively. Transfusions were administered for a hemoglobin less than 8 gm/dl or symptomatic anemia. VTED prophylaxis was continued for 14 days. Group A received Enoxaparin beginning 18-24 hours postoperatively. Group B wore the pneumatic sequential compression device at least 20 hours daily, beginning during surgery on the non-operative and immediately following surgery on the operative limbs. Group C received TXA 1 gm IV at incision and at closure, and the pneumatic sequential compression device.

Results: There were 61 consecutive patients in each group. 19 (31%) of Group A, 12 (20%) of Group B, and 6 (10%) of Group C received transfusions. There were no major symptomatic VTED events.

Conclusions: The pneumatic sequential compression device alone and in combination with TXA dramatically reduced transfusion by 35% and 68% respectively without increasing the risk for VTED. With only a 10% risk of transfusion with this protocol, elimination of preoperative autologous blood donation is reasonable.Notes:

Notes:

1:10pm – 1:14 pm

Modular Distal Femoral Endoprosthetic Replacement for Nontumour Limb Salvage

Cynthia M. Kelly, MD
Ross M. Wilkins, MD
Ronald R. Hugate, MD

Introduction: Patients who sustain a complex distal femur fracture and/or suffer from an uncontrolled infection of the distal femur present a challenge to orthopaedic surgeons. Historically, treatment methods have included internal fixation or amputation. Both of these methods have been shown to restrict a patient's ability to weight bear on the extremity, which can lead to significant changes in lifestyle and prolong recovery.

Methods: In a retrospective review, 24 patients were treated for either a fracture or infection of the distal femur using a modular, distal femoral tumor type prosthesis. All surgical treatment was performed by an orthopaedic oncologist familiar with this type of prosthesis. The patients presented with complications including failed fixation, infections, limb length discrepancy, malunions and nonunions. An average of 4.0 operations had been performed on 21 of the 24 patients prior to the definitive operation with the distal femoral replacement. Patients who presented with an infection at the surgical site were treated in a staged fashion with irrigation and debridement, I.V. antibiotics, antibiotic impregnated beads and/or an antibiotic impregnated spacer. After the endoprosthetic replacement, patients were mobilized by a physical therapist and allowed to weight bear as tolerated. Cementation of the femoral stem allowed for immediate postoperative weight bearing. Patients also began an aggressive range of motion protocol postoperatively to regain motion often lost due to previous immobilization.

Results: All patients reported improved function using a modified Hospital for Special Surgery knee score surveys. Only five patients had a failure at the time of this report.

Conclusions: The use of a modular distal femoral replacement for the treatment of a fracture or infection of the distal femur is a straight forward operation and allows for immediate postoperative weightbearing and mobilization of patients who have sustained a significant injury. The prosthesis restores limb length, decreases the number of surgical procedures, and speeds patient recovery.

Notes:

1:14pm – 1:18 pm

Quadriceps Tendon Ruptures: Comparing Outcomes Between Suture Anchor and Bone Tunnel Repairs

Daniel M. Elkin, MD
Mark C. Reilly, MD
Mark R. Adams, MD

Introduction: Rupture of the quadriceps tendon is an infrequent but debilitating injury primarily affecting individuals over the age of 40. While a trans-osseous suture technique is the standard of care for these injuries, reports in the literature describe the use of suture anchors for repairing the quadriceps tendon. The purpose of this study is to compare these two techniques.

Methods: This is a retrospective review of acute quadriceps tendon repai

rs at a single institution from 2004-2014. Demographics, range of motion, quadriceps strength, and complications were analyzed for suture anchor and trans-osseous tunnel repairs.

Results: There were 10 patients with 11 repairs in the suture anchor group and 17 patients with 22 repairs in the tunnel group. Mean age was 54 (range 35-74) for anchors and 49 (range 33-68) for tunnels. Follow-up averaged 5.8 and 15.2 months for the anchor and tunnel groups, respectively. There was one partial re-rupture in the anchor group (9%) and three re-ruptures in the tunnel group (14%). One of the re-ruptures underwent revision while the other three patients were lost to follow up. The most common complication in the anchor group was the knee giving way (18%). The most common complications in the tunnel group were quadriceps atrophy (18%) and the knee giving way (18%). Knee flexion at final follow up (mean 107 for anchors and 126 for tunnels) was significant. There were no significant differences for BMI, quadriceps strength, age, or complications between the two groups.

Discussion and Conclusion: The most devastating complication after repair of the quadriceps tendon is re-rupture. Our study found that the re-rupture and complication rates between suture anchor repair and trans-osseous suture tunnel repair are comparable. Suture anchor repair has promise as an alternative repair method, although the postoperative range of motion may be decreased compared with the standard technique.

Notes:

1:18pm – 1:22 pm

Comparison of Patella Fracture Fixation Methods Using Braided Cable Vs Monofilament Wire

Adam N. Wooldridge, MD, MPH
Jessie J. Dickens, MD, MS
Justin Jones, BS
Steven Wilding, BS
Mark Jenkins, MD

Introduction: Displaced patella fractures have traditionally been repaired with Kirschner wires and tension band wires over the anterior surface of the patella. At our institution, tension bands have been created with either stainless steel wire or braided cable. The current literature is lacking comparison of outcomes.

Methods: A retrospective review comparing outcomes of revision surgical rates for pain, hardware failure, and operative time. A retrospective cohort study was conducted on all patients treated for patella fractures within the last 5 years by Orthopedic Surgeons at Texas Tech University Health Sciences Center. Fractures that were classified as AO/OTA 34-C1 and AO/OTA 34-C2 fractures were included. Of the 73 patients initially identified, 37 (51%) met the inclusion criteria and were available to study.

Results: Post-operative fracture gap was decreased in the braided cable group (6.7%) as compared to the tension wire group (27.2%). Hardware irritation occurred less often in the braided cable group (40.0%) than the tension wire group (45.5%) (p=0.11). Worker's compensation patients had increased odds of reoperation (OR = 8, p=0.05). The overall rate of reoperation was 32.4 % with no statistical difference (p=0.72) between the braided cable group (26.7%) and tension wire group (36.4%). We were unable to show a statistically significant difference in these variables. However, there was a trend toward less residual fracture gap in the cable group at 6.7% vs. 27.2%.

Discussion In summary, in this retrospective study, we examined patella fractures treated with anterior tension band techniques used at our institution in past 5 years. The braided cable group demonstrated a trend towards improved outcomes although not statistically significant. The authors recommend the use of braided cable in tension band fixation of patella fractures and future randomized control trials to validate the outcomes of current and prior studies.

Notes:

Saturday, August 1, 2015

Rapid Fire Session 13D — Trauma

Moderator: Keith A. Mayo, MD

12:55pm – 12:59pm

Debridement of Open Tibia Fractures More Than 48 Hours After Injury: Does Time to Surgery Matter?

Nathanael Heckmann, MD
Jason A. Davis, MD
Kyle Mombell, BA
Geoffrey Marecek, MD

Introduction: Surgical debridement is a critical step in the successful treatment of open tibia fractures. Although most

surgeons aim for debridement within 6 to 24 hours, the optimal time to debridement is not known. Recent reports have suggested other factors such as Gustilo-Anderson type, prompt initiation of antibiotics, and time to definitive closure are more predictive of infection than time to surgery. We sought to determine the effect of a prolonged delay to surgical debridement for open tibia fractures. Our hypothesis is that time to surgery for open tibia fractures does not affect the infection or reoperation rates for open tibia fractures.

Methods: All patients treated for an open diaphyseal tibia fracture (OTA/AO 42) at a level I trauma center between 2011 and 2014 were identified using CPT codes. Patients were excluded for age < 18, less than 12 weeks of follow up, or a history of prior surgery to the injured tibia. Patient factors such as age, gender, mechanism of injury, laterality, tobacco and drug use, medications (i.e. NSAIDs, steroids, anticonvulsants, etc.), and co-morbidities were recorded. The open fracture classifications of Gustilo-Anderson and the OTA were also applied. Patients were divided into 3 groups based on time to surgery: (group A) 48 hours. Patient charts were reviewed for deep infection and reoperation for any cause. A Fisher's exact test was used to determine statistical significance between infection and reoperation rates amongst the various groups.

Results: We initially identified 128 patients, with 91 available for analysis after exclusion criteria were applied. There were 44 patients in group A, 24 in group B, and 23 in group C. Infection rates for groups A, B, and C were 6.8%, 8.3%, and 8.7% respectively. Reoperation rates for groups A, B, and C were 25.0%, 20.8%, and 17.4% respectively. In terms of Gustilo-Anderson classification, there were 17 type I, 50 type II, 4 type IIIA, 19 type IIIB, and 1 type IIIC with reoperation rates of 11.8%, 10.0%, 50.0%, 57.9.0%, and 0% respectively. The groups did not vary in proportion of Gustilo-Anderson fracture types. No other factors assessed were predictive of infection or reoperation rates.

Conclusion: A delay of more than 48 hours to surgical debridement of open tibia fractures did not result in a greater reoperation rate. The Gustilo-Anderson classification was more predictive of reoperation with Types IIIA and IIIB injuries having a statistically significant higher reoperation rate than the other types.

Notes:

12:59pm – 1:03pm

Blade Plate Revisited: Treatment of High Energy Proximal Femur Fractures

Timothy S. Achor, MD
Patrick C. Schottel, MD
Denise H. Hansen, PA-C
Ross G. McFall, BS

Purpose: High energy proximal femur fractures are devastating injuries that have historically been treated with a variety of implants. Recently, intramedullary nails have gained popularity due to biomechanical studies showing their superiority to locked plating and 95-degree blade plates. However, our clinical experience is that open reduction and maximal compression of the fracture with a blade plate and articulated tensioner results in high rates of bony union and anatomic proximal femur restoration. The objective of our study is to describe the clinical outcomes of patients with high energy proximal femur fractures treated with 95-degree blade plate and articulated tensioner.

Methods: Consecutive patients from March 2012 to January 2014 who underwent proximal femur fracture open reduction and stabilization with a 95-degree blade plate were retrospectively studied. Patient characteristics, fracture pattern and operative details including the use of an articulated tensioner were recorded. Postoperative complications such as infection and need for secondary surgery were noted.

Results: Twenty-four patients were initially identified and seven (29%) were excluded due to young age or lack of one-year clinical follow-up. Mean clinical follow-up was 13.6 months and the mean cohort age was 40.2 years. The articulated tensioner was used in 100% of cases. Two patients had their blade plate removed secondary to symptomatic hardware and another underwent revision with an intramedullary nail due to persistent nonunion. No patients had evidence of infection. Fifteen patients (94%) had radiographic evidence of union at final follow-up.

Discussion and Conclusion: We found that high energy proximal femur fractures treated with a 95-degree blade plate and articulated tensioner had a high rate of radiographic union and minimal postoperative complications. We believe this operative technique successfully achieves anatomic alignment, limb length and bony union. Use of an articulated tensioner to obtain maximal compression is of paramount importance when using the blade plate.

Notes:

1:03pm – 1:07 pm

Major Complications Following Use of the Reamer Irrigator Aspirator

F. Andrew Rowan, MD, MS
John D. Kierstead, BS
John R. Matthews, BS
Greg Crisp, BS
Michael P. Dohm, MD

Introduction: With the internet becoming an increasing source for acquiring health-related information, it is critical to direct patients to websites that provide reliable and evidence based information relevant to the consumer. This study aims to determine the different type and quality of information retrieved when searching "total knee arthroplasty" vs. "total knee replacement."

Methods: 120 total websites through the top 3 search engines were reviewed with the DISCERN instrument using two search terms, "total knee replacement" (TKR) and "total knee arthroplasty" (TKA).

Results: After the removal of duplicated websites a total of 63 unique websites were evaluated, 29 for the search term TKA and 34 for TKR. A total of eight websites were duplicated across the search terms. The average overall DISCERN score with TKA was 2.20 with 31% (9/29) of the websites classified as "good," (DISCERN score ≥ 3) compared to 2.40 and 38.2% (13/34) using TKR. In total, TKA provided 46.7% (28/60) non-commercial websites with the highest number seen in Google with 50% (10/20) non-commercial sites returned as compared to TKR at 36.7% (22/60) with Google also providing the most at 45% (9/20).

Discussion and Conclusion: The majority of websites related to search terms TKA and TKR do not provide reliable non-commercial information. Furthermore, there is little difference in the quality of information obtained between search terms using medical terminology (TKA) compared to non-medical terminology (TKR). With these results in mind, surgeons should be mindful of the information their patients are reading.

Notes:

1:10pm – 1:14 pm

Prophylactic Fixation of Contralateral Side Is Cost-Effective After Bisphosphonate-Associated Atypical Femur Fracture

Bonnie Yi-Jun Chien, BA
*Julius A. Bishop, MD
David J. Kaufman, MD
Michael Longoria
Ross Shachter, PhD

Introduction: Long-term bisphosphonate use can increase risks of atypical subtrochanteric fractures and contralateral involvement. Surgical treatment of incomplete fractures has been found to be more safe and effective than non-operative treatment. This study assesses the cost-effectiveness of contralateral prophylactic fixation after unilateral bisphosphonate-associated fracture.

Methods: A Markov Cost-Effectiveness model was created based on patient age at time of fracture (60-90), and presence or absence of risk factors (pain, radiographic findings). Sensitivity analysis was performed on outcome probabilities, costs, and utilities in the form of quality-adjusted life years (QALYs), which were determined using orthopaedic literature and expert opinion. QALYs were assumed to decrease by 10% for each year of prodromal pain, 5% for displaced fracture, 30% for displaced fracture with complications, and 10% for prophylaxis with complications. Incremental cost-effectiveness ratios (ICER) were calculated by dividing extra costs by gains in QALYs. ICER$100,000 or QALYs lost as not cost-effective.

Results: Contralateral fracture risk over 5 years was valued at 25% with no risk factors, 45% with 1 risk factor and 61%

with 2 risk factors. Displaced fracture surgery was estimated at $36,200, with an extra $10,000 from complications, which was approximated at 40%. Prophylaxis was estimated at $16,600, with an extra $1000 from complications, approximated rate at 20%. Sensitivity analysis demonstrated cost-effectiveness of prophylaxis at any age with risk factors (pain or radiographic findings). Without risk factors, prophylaxis was possibly cost-effective for ages 60-78 but not cost-effective if 79 and older.

Discussion and Conclusion: This is the first study supporting contralateral prophylactic fixation in the setting of younger age and pain or radiographic changes, with advantages including high likelihood of successful surgery and avoidance of displaced fracture. Further research is indicated to study prophylactic surgery efficacy.

Notes:

1:14pm – 1:18pm

Fluoroscopically-Guided Percutaneous Screw Fixation for Pelvis and Acetabular Trauma: Is It Safe?

James Learned, MD
Clay Spitler, MD
Milton T. M. Little, MD
Jonah Hebert-Davies, MD
Milton "Chip" Routt Jr., MD
Reza Firoozabadi, MD

Introduction: Percutaneous fixation is the standard of care for many pelvic ring injuries. Advances in insertion technique have allowed surgeons to place screws in a percutaneous fashion, however reports of unsafe screw placement and risks of iatrogenic neurovascular injury have led some to advocate for the use of navigation to avoid unsafe trajectories. Our purpose was to determine the incidence of unsafe screw trajectories when only fluoroscopic guidance was used.

Methods: Our study was a retrospective chart review, including all patients treated with percutaneous pelvic fixation by fellowship-trained orthopedic traumatologists at a level-one trauma center from 2008-2012. Injury and post-operative CT scans, as well as intraoperative imaging were reviewed for injury pattern and fixation location; charts were reviewed for postoperative neurological deficits.

Results: Patients were treated with cannulated and non-cannulated orthopedic implants. 773 iliosacral, 609 transiliac-transsacral and 511 anterior column screws were placed in 738 patients. 29 (4.8%) Transiliac-transsacral and 18 (2.3%) Iliosacral screws were malpositioned. These screws either violated the anterior or foraminal sacral cortex, or the anterior innominate bone. No sacral foramen had more than 20% violation. Anterior column screws either violated the innominate cortex or were >20mm too long. Chart review, however, revealed no patients with a documented post-operative nerve deficit. 12 screws, all posterior, were revised based on post-operative imaging assessment.

Discussion and Conclusion: Percutaneous pelvic fixation is the primary method of internal fixation for most pelvic ring injuries and some acetabular fractures. Inappropriate positioning and inadequate imaging can affect the surgeon's ability to safely place screws. A detailed assessment of plain radiographs and advanced imaging, a thoughtful pre-operative plan and adherence to safe techniques in the operating room lead to the safe placement of percutaneous pelvic screws. We believe that placing screws using fluoroscopic guidance is a safe technique when the proper precautions are observed.

Notes:

1:18pm – 1:22pm

Acetabular Fracture Fixation Utilizing Kocher-Langenbeck Approach Without Specialty Traction Table

Patrick C. Schottel, MD
*Camden M. Tissue, MD
Jeffrey L. Brewer, MD
Jason A. Davis, MD
Milton "Chip" Routt Jr., MD

Introduction: The Kocher-Langenbeck approach is a commonly utilized exposure for acetabular fracture surgery.

Typically, this approach is performed using a specialized traction table to provide joint distraction and indirect fracture fragment reduction. However, a specialty traction table can be expensive and its use may be complicated by ipsilateral extremity fractures. The objective of our study is to describe the benefits of a focal Kocher-Langenbeck prepping and draping using a common radiolucent operative table.

Methods: Sixteen consecutive acetabular fracture patients from October 2014 to January 2015 who underwent a prone Kocher-Langenbeck approach were retrospectively studied. All patients had only their buttock and proximal thigh of the operative side exposed. A specialty traction table was not used. Patient characteristics, fracture pattern and operative details such as the use of a universal distractor were recorded. Postoperative computed tomography (CT) as well as any change in the operative extremity sensory or motor exam were collected.

Results: The mean age of our cohort was 43.1 years and 88% were male. The most common acetabular fracture pattern was transverse with associated posterior wall (62.5%). The universal distractor was used in 44% (7/16) of cases. Three patients (19%) had an ipsilateral extremity injury that precluded the entire leg from being prepped into the field. No articular malreductions of greater than 2mm using postoperative CT were noted. Additionally, there were no patients with evidence of iatrogenic motor or sensory neurological injury.

Discussion and Conclusion: We found that limited extremity prepping and draping for a prone Kocher-Langenbeck approach without the use of a specialty traction table did not result in postoperative neurological complications or malreduction of the acetabular fracture. We believe this operative technique is especially beneficial in patients with ipsilateral extremity injury that could complicate the use of a traction table and possibly contaminate the surgical field.

Notes:

Western Orthopaedic Association

Scientific Poster Exhibits

July 30 – August 1, 2015

Poster presenters will have an opportunity to
report their findings during the designated times indicated
on the Scientific Program Schedule.

Scientific Posters will be on display during the Scientific Program
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Poster Presentations

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BASIC SCIENCE

Poster 1

Characterization of ACL-Derived Progenitor Cells on a Polymeric Scaffold

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Tomasz J. Kowalski, MD, PhD
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Introduction: The purpose of this study was to characterize a subpopulation of resident, anterior cruciate ligament (ACL)-derived progenitor cells in regards to proliferation and collagen deposition on a polymeric scaffold for ACL tissue engineering.

Methods: Ruptured ACL tissue from adult donors was enzymatically digested and FACS-sorted to specifically isolate ligament-forming fibroblasts (LFF: CD44+, CD146-, CD34-, CD 31-, CD45-), a subpopulation of ACL-derived progenitor cells. The cells were seeded on a polycaprolactone (PCL) scaffold and cultured to assess proliferation and collagen deposition. Cell-scaffold constructs were harvested after 1, 3, 7 and 14 days, and proliferation capacity was evaluated using the Picogreen assay, scanning electron microscopy (SEM), and DAPI staining. A subset of LFFs was cultured on standard tissue culture plate as a control. To assess collagen deposition on scaffold, cell-scaffold constructs were harvested after 4 weeks and collagen content quantified using the hydroxyproline assay. Four different culture environments were utilized: 20% FBS, ascorbate (50ug/mL), ascorbate + low dose FGF-2 (2ng/mL), and ascorbate + high dose FGF-2 (10ng/mL). Additionally, type I and III collagen deposition were evaluated by Picrosirius Red staining.

Results: LFFs exhibited robust proliferation potential on PCL scaffolds. Growth rates did not statistically differ from that of cells grown on standard tissue culture plate. The cells and their matrix formed a loose, linear organizational pattern on the scaffold. LFF-scaffold constructs cultured in low-dose FGF-2 contained a significantly greater concentration of collagen versus that of other culture conditions. Cells cultured in FGF-2, regardless of dose, appeared to deposit more type I collagen than those cultured without the growth factor.

Discussion and Conclusion: ACL-derived ligament-forming fibroblasts demonstrated notable biocompatibility with PCL scaffolds and the ability to deposit type I collagen, which was enhanced by the addition of FGF-2. These resident progenitors may be an attractive cell source for ACL tissue engineering.

Poster 2

An Update on the Material Available for the Tension-Banding of Bone Fractures

John Mahajan, MD
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Bruce I. M. Condez, BS
Jeremi Leasure, MS
James G. Distefano, MD

Introduction: Tension band wiring is a valuable tool in fixing eccentrically loaded bone. Literature shows that 18 to 24 gauge stainless steel wire has a high tensile strength and is suitable for these applications. There is a braided suture that has excellent tensile strength and may provide some advantages by contouring to the fracture site. It is the goal of this study to evaluate the mechanical integrity of this braided suture for use in tension banding applications.

Methods: Several gauged wires, fiber wires, and the braided suture were configured to a servo-hydraulic system for tensile

testing. Each item was categorized into a looped configuration and a single strand configuration. The outcomes measured were ultimate strength, yield strength, and stiffness. Differences between mean outcome measurements were analyzed between the two configurations with a repeat-measures ANOVA design with alpha 0.05.

Results: The braided suture, in a looped configuration, had an ultimate strength of 976.10 ± 8.93 N; whereas, 18 Gauge Stainless Steel and 2 Gauge Fiber Wire had lower mean ultimate strengths of 908.86 ± 65.79 N and 161.02 ± 13.01 N respectively.

Conclusion: The use of gauged wire in tension band fixation of olecranon and patellar fractures has been reported to have hardware complications as high as 50%. The concern with using sutures instead for tension banding, which would be more conformable, is that stiffness would be limited and allow too much micro motion at the fracture site. In this biomechanical study looped the braided suture shows great potential as a tension band material with its high ultimate tensile strength and yield strength in addition to stiffness that approaches that of 18 gauge wire.

Poster 3

Effect of Tourniquet on Lower Extremity Oxygenation During TKA

Ryan Mayer, BS
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Goutham Ganesan, BS
Bruce Tromberg, PhD
Ran Schwarzkopf, MD, MSc

Introduction: Tourniquet use during knee arthroplasty has had the reported benefits of reduced intraoperative blood loss, cleaner surgical fields and reductions in operative time; however, some studies have associated prolonged tourniquet use with increased complication rates, longer post-operative recovery and decreased range-of-motion. The goal of this study is to describe the dynamics of oxygen saturation (StO2) during intra-operative tourniquet application utilizing diffuse optical spectroscopy (DOS), a non-invasive optical method.

Methods: Fourteen patients undergoing total knee arthroplasties (TKAs), 9 primary TKAs and 5 revision TKAs had the DOS sensor placed distal to the tourniquet to record the patient's somatic oxygen saturation prior to tourniquet inflation to 250 mm Hg until the completion of the case. DOS is a spectroscopy system that non-invasively quantifies hemoglobin content and oxygenation in real time. The primary DOS outcomes analyzed were StO2 and its kinetics during onset and release of tourniquet pressure.

Results: The mean tourniquet time was 85.5 ± 4.8 minutes, with longer times used in revisions. The average baseline StO2 prior to tourniquet inflation was 74.9 ± 2.5 %, and mean minimum ischemic StO2 was 12.9 ± 4.1%. Mean StO2 following reperfusion after tourniquet release was 81.0 ± 2.4, which was significantly higher than baseline StO2 ($p = 0.011$). Using a two-phase linear fit, the mean time from tourniquet onset until steady state was 25.4 ± 4.1 minutes. There were three subjects whose post-release peak StO2 was lower than baseline.

Discussion and Conclusion: DOS is capable of monitoring tissue StO2 intra-operatively distal to the tourniquet, providing real-time information on hemoglobin content and StO2. This study showed significantly higher mean StO2 over baseline after tourniquet release, as well as kinematic parameters that might better characterize patient's physiologic response during ischemia. This data may also help establish the ideal tourniquet time limits for TKA in order to achieve the best clinical outcomes.

Poster 4

Nonsteroidal Anti-Inflammatory Drugs Effect on Cartilage and the Chondrocyte

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Gregory L. DeSilva, MD
F. Andrew Rowan, MD, MS

Introduction: Nonsteroidal anti-inflammatory drugs (NSAIDs) are the most commonly prescribed class of pain medications. Their use following fracture fixation has recently been questioned, with evidence of adverse effects on bone formation and fracture healing. Research has also demonstrated that NSAIDs have numerous negative effects on cartilage maintenance and chondrogenesis. The purpose of this review was to identify the effect of NSAIDs on cartilage and chondrocyte function specifically focusing on difference in COX selectivity and NSAIDs classes.

Methods: A review of the literature was conducted in accordance with guidelines described in the Cochrane handbook for systematic reviews. ISI world of science, embase, google scholar and MEDLINE were used for the complete search. Relevant articles were identified by searching "NSAIDs" (and other iterations) with various keywords including "chondrocyte" and "cartilage." Following this preliminary identification, articles were included based on inclusion and exclusion criteria. Inclusion criteria utilized were articles published after 1980 and in the English language. Animal and Human studies were included, as well as clinical and basic science research. Articles were excluded if cartilage or chondrocyte function was not analyzed as part of the outcomes.

Results: 18 drugs were included in the review. Drugs were placed into 1 of 3 categories (Potentially Unsafe, Safe or Beneficial) based on research found. 5 drugs included were found to possibly beneficial to cartilage homeostasis. 2 were found to be safe. The majority,11, of the drugs in the review were found to be potentially unsafe. Our review found selective COX-2 drugs to be less harmful to cartilage and chondrocytes.

Discussion and Conclusion: Our review of the literature found that COX-2 selective inhibitors as a class are safer than non-selective NSAIDs to cartilage and chondrocyte function. However, all drugs reviewed had literature demonstrating potentially negative effects, only more research will provide answers as to which drugs are safest.

Poster 5

Long-Term Safety and Efficacy of Human Bone Morphogenetic Protein (hBMP) In the Treatment of Resistant Non-Unions and Failed Arthrodesis

Hamed Yazdanshenas, MD
Arya Nick Shamie, MD

Introduction: The bone morphogenetic protein (BMP) has emerged as a suitable alternative to autogenous cancellous bone grafting and despite current knowledge about its mechanism; few studies provide evidence about the long-term safety of BMP. The aim of this investigation is to determine if BMP implantation is a safe and effective agent in a long-term setting for the treatment of patients with resistant nonunions and failed arthrodesis.

Method: A retrospective case series study that was conducted on 55 patients who had received BMP. Collected data included all related surgical history, and clinical and x-ray data both pre-operatively and post-operatively. All patients were scheduled for follow-up evaluations at one week and 1, 3, 6, 12, and 24 months post-operatively. After the 24-month follow up evaluation, patients were instructed to return on a yearly basis or if they developed an adverse event related to the operation.

Results: Seven patients (13%) experienced adverse events related to their surgery with hBMP. Six patients (11%) experienced persistent nonunion; five of these underwent further revision surgery. One patient (2%) developed an infected nonunion. No patients experienced tumor induction, allergic reaction to hBMP. The remaining 48 patients all achieved osseous union within six months of hBMP implantation.

Discussion and Conclusion: This study differs from previous literature by providing data suggesting that the use of hBMP is a safe, non-toxic, and efficacious treatment method for resistant nonunions and failed arthrodesis in the long-term setting.

FOOT & ANKLE

Poster 6

Temporizing External Fixation of Calcaneus Fractures Prior to Definitive Fixation

Brian Farrell, MD
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Charles Moon, MD

Introduction: Surgical management of calcaneus fractures is technically demanding and has a high risk of wound complications. Traditionally these fractures are managed with splinting until swelling has subsided, which can take weeks and leaves the fracture fragments displaced. We describe a novel protocol for the management of displaced intra-articular calcaneus fractures utilizing a temporizing external fixator and staged conversion to plate fixation through a sinus tarsi approach. The goal of this technique is to allow for earlier treatment with open reduction and internal fixation, minimize the amount of manipulation required at the time of definitive fixation and reduce the wound complication rate seen with the traditional extensile approach.

Methods: The records of patients with displaced calcaneus fractures from 2010-2013 were retrospectively reviewed. A total of 7 patients with 8 calcaneus fractures were treated with this protocol. All patients underwent ankle-spanning medial external fixation within 24 hours of injury. Patients underwent conversion to open plate fixation through a sinus tarsi approach when skin turgor had returned to normal. Time to surgery, infection rate, wound complications, radiographic alignment, and time to radiographic union were recorded.

Results: The average Bohler's angle improved from 13.2 degrees preoperatively to 34.3 degrees postoperatively. The average time from external fixation to conversion to internal fixation was 4.8 days. There were no immediate post-surgical complications. The average time to weight bearing was 8.5 weeks. The average time to radiographic union was 9.5 weeks. There were no infections or wound complications at the time of last follow-up.

Discussion and Conclusion: Early temporizing external fixation for the acute management of displaced calcaneus fractures is a safe and effective method to reduce and stabilize the foot and may decrease the time to definitive fixation. In our series there were no complications related to the use of the external fixator.

HAND & WRIST

Poster 7

Upper Limb Prosthetic Control Systems: Current Technology and Future Directions

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Introduction: Recent advances in materials, concepts, and production techniques have lead to substantial improvement in the functionality of upper limb prostheses. Despite this, end user satisfaction remains low, with prosthetic users reporting considerable difficulty performing complex tasks, even with the most cutting edge products. However, technological advancement in this field continues to occur at a rapid pace. Targeted muscle reinnervation, direct cortical control, and integration with peripheral nervous tissue are all control paradigms that may ultimately lead to dramatic breakthroughs in prosthetic functionality.

Methods: A comprehensive literature review with discussion of the significant current technological advancements in the field.

Results: A summary and explanation of the significance of recent advances in the production and capabilities of upper-limb prosthetics.

Discussion and Conclusion: Refinements of myoelectric control systems have allowed for rapid advances in available devices, while the promise of neural and PNS interfaces gives researchers an ethereal goal to chase. Improvements in materials and manufacturing methods will allow for lighter, durable, and more economically feasible prosthetics. Meanwhile, advancement in neural integration involving both motor and sensory modalities will eventually allow for the production of limbs that may be physiologically and psychologically fully integrated within a patient's life.

Poster 8

Relevant Insertion Site Anatomy of the Conventus Distal Radius System

Jacob Duncan, DO
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Marc Trzeciak, DO

Introduction: The distal radial system (DRS) is a nitinol fixation scaffold that is inserted into the medullary canal of the radius from its radial aspect. The purpose of this study was to identify the anatomy of this insertion site as it relates to the radial sensory nerve (RSN), lateral antebrachial cutaneous nerve (LABC), and brachioradialis (BR) tendon.

Materials and Methods: Ten fresh frozen cadavers were utilized, 5 of which included the elbow, and 5 of which included the shoulder. There were 9 females and one male. Average age of the cadavers was 71 years (range 66-88 years). With the aid of fluoroscopy, a 1.1mm target k-wire and Conventus scaffold template were introduced as per the manufacturer's guidelines. We then utilized a large access guide to mark the skin overlying the insertion site. Dissection was carried down to the level of the RSN with careful attention paid to preserving the native anatomic location of the nerve. We again introduced the access guide and marked the potential insertion location for the side-cut drill. This point was measured in relationship to relevant anatomic structures nearby, including the RSN, BR, LABC, and distance from the radial styloid (RS) tip.

These measurements were then repeated with the small access guide.

Results: The large access guide landed on the RSN in 4/10 cadavers, landed volar to the RSN in 6/10. When volar, the distance to the RSN averaged 1.7mm. The distance from the tip of the RS to the insertion site of the large access guide averaged 44.5mm. The small access guide landed on the RSN in 2/10 cadavers, landed volar to the RSN in 4/10, and landed between the RSN bifurcation in 4/10. When volar, the distance to the RSN averaged 3.25mm. When the RSN bifurcated, the distance from the small access guide to the both the dorsal and the volar branches was 3.5mm. The distance from the RS to the insertion site of the small access guide averaged 37.8mm. The LABC was found in 4/10 cadavers. It was consistently found dorsal to the small and large access guides at a distance of 8.5mm/9mm respectively. Both the large and small access guides landed either on or just dorsal to the BR tendon in all specimens.

Discussion: The RSN is in close proximity to the entry sites for both the small and large DRS devices. Based on this study, it is advised that the RSN and/or its branches be retracted dorsally along with the LABC nerve when exposing the radial shaft for DRS insertion. If one uses the small access guide, there is greater chance of being in a location distal to the bifurcation of the RSN. Volar retraction of the BR tendon should be considered.

Poster 9

The 100 Most Cited Articles Concerning Distal Radius Fractures

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Gregory L. DeSilva, MD

Introduction: Bibliometric studies are increasingly being utilized as a tool for gauging the impact of individual articles within a given field. The purpose of this study was to identify the most cited articles related to distal radius fractures in the orthopedic literature, to better understand how the evidence of this topic has been shaped and changed over time.

Methods: We utilized the ISI web of science database to conduct a search for the term "distal radius fracture" under the "orthopaedics" research area heading, and sorted the results by number of times cited. The 100 most cited articles published in orthopaedic journals were then analyzed for number of citations, source journal, year of publication, number of authors, study type, level of evidence, and clinical outcomes utilized.

Results: The 100 most cited articles identified were published between 1951 and 2009. Total number of citations ranged between 525 and 67, and came from ten different orthopaedic journals. The largest number of articles (36) came from the JHS, which combined with JBJS-America (32) was the source of more than two-thirds of the articles. In accordance with previous analysis of orthopaedic literature, the articles were primarily clinical, and of these, 53/76 were case series. Only five clinical papers were deemed to be Level I evidence, with the vast majority representing Level IV evidence.

Discussion and Conclusion: These data show that despite distal radius fractures being a common fracture encountered by physicians, very few of the articles were high quality studies. This was especially true for literature publish greater than 25 years ago, although a slight trend toward improvement in level of evidence was seen in this study. Surgeons must take this lack of high-level evidence into consideration when referencing classic papers in our field.

Poster 10

Trauma-Related Upper Extremity Amputations: An Epidemiologic Study Using the National Trauma Data Bank

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Introduction: Despite much literature on predictors of outcomes following severe lower extremity trauma and the decision to salvage or amputate, there is little data examining the epidemiology and outcomes of severe upper extremity trauma. We used the National Trauma Data Bank (NTBD) to investigate the epidemiology of upper extremity amputations and to assess predictors of complications and re-amputation.

Methods: We conducted a secondary data analysis of the 2009-2012 NTDB Research Data Sets, using means and frequencies to describe the patient population and the distribution of major upper extremity amputations. Multivariable regression models were fit to identify predictors of major adverse surgical complications, rate of re-amputation, and length of hospitalization.

Results: A total of 1,386 patients underwent a major traumatic upper extremity amputation from 2009-2012. Four hundred and eleven (29.65%) patients required at least one re-amputation. 18.54% of amputees experienced a major post-surgical complication. The most frequent major post-surgical complications included pneumonia (27.55%), acute lung injury (17.35%), and deep vein thrombosis (13.78%). The average length of hospitalization was 16.46 days. Patients with at least one re-amputation stayed in the hospital approximately seven days longer than patients not needing a reoperation (21.25 days compared to 14.44 days). Statistically significant predictors of major post-surgical complications, re-operations, and length of hospitalization are included in Table 1.

Conclusion: While much literature exists to guide treatment after severe lower extremity injuries, they provide little guidance to predicting outcomes or guiding treatment of severe upper extremity trauma. We report a high rate of complications and re-amputations among upper limb amputees, and identify predictors of surgical outcomes that have not been described in the literature. This work provides prognostic information for patients with upper limb threatening injuries and identifies potentially modifiable risk factors (time to surgery and prevention of compartment syndrome) and hospital characteristics that could affect outcomes.

PEDIATRICS

Poster 11

Blumensaat-Epiphyseal Containment of the Knee (BECK): A New Radiological Tool for Determining Patellar Height

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Introduction: Radiographic measurement of patella alta and baja in pediatrics can be challenging due to age-related ossification and changes in bony landmarks. Current measurement methods utilize complex ratios comparing patellar length and position relative to the tibia, femur, or both, but can have significant inter- and intra-observer variability. A simple, accurate radiographic method to determine patellar height is needed. On lateral radiographs, the angle formed by Blumensaat's line and the epiphyseal line define an area of patellar containment without relying on calculated ratios. The objective of this study was to investigate the relationship of the patella within this observed angle, deemed the Blumensaat-Epiphyseal Containment of the Knee (BECK).

Methods: Lateral radiographs of ten fresh-frozen cadaveric knees (mean age 19.5) were taken in 15° increments from 0°-90° knee flexion. A constant 22N tension was manually applied to the quadriceps tendon to ensure patellofemoral tracking. On each radiograph, BECK angle and patellar position were measured. Full patellar containment occurred when the superior pole was below the epiphyseal line and inferior pole above Blumensaat's line. Alta was defined as the percentage of pole-to-pole patellar length above the epiphyseal line. Baja was defined as the percentage pole-to-pole patellar length below Blumensaat's line. Intra- and inter-observer variability was assessed from three different observers.

Results: The mean BECK angle was 49.1±2.6°. Maximum patellar containment occurred at 50° flexion. The patella was 87% alta at full extension and 60% baja at 90° flexion. The patella had 75% or greater containment from 35°-67° flexion, and 50% or greater containment from 21°-84° degrees of flexion. There were no significant intra- or inter-observer differences, with all Pearson coefficients greater than 0.80.

Discussion and Conclusion: Based on these results, utilization of the BECK angle within a designated flexion range could provide an easy and useful means of determining patellar height in pediatrics.

Poster 12

Alignment, Strength, and Balance in the Youth Soccer Player

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Elizabeth Ignacio, MD
Yongjun Cheng, MS
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Kevin Chang, ATC
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Introduction: Anatomical alignment and rotational profile change with growth and development. Additionally, matura-

tion influences neuromuscular factors and strength ratios known to affect injury rate in the adult. There is limited data on how these dynamic factors affect injury mechanics. Recent studies have attempted to extrapolate adult individual risk factors to pediatric athletes. Our study aimed to expand on this by actually looking at the rotational profile, lower extremity strength and balance of young female soccer players.

Methods: 126 female soccer players, age 10-14 years old, from ten teams from two soccer clubs during the 2013 season were included. All participants underwent baseline rotational profile measurements as described by Staheli, as well as measurement of trochanteric prominence angle, quadriceps (Q) angle, leg length, strength testing of the hip and thigh musculature, and Y-balance testing. The pubertal status was obtained via questionnaire from the parents as a marker of physiologic age. Descriptive statistics were used to summarize each measurement, stratified by age, both chronological and physiologic.

Results: There were expected significant gains in leg length and strength of all musculature with increasing chronological and developmental age. No significant difference was found in the rotational profile when compared for the three developmental categories. A significant difference was found between the measurements of right and left leg external rotation when compared for pubertal status. Q angle was not found to correlate with chronological or developmental age. There was no significant difference for the quadriceps:hamstring ratio when both chronological and developmental age were compared. Y-balance scores showed a significant increase on the left side with increasing age.

Discussion and Conclusion: The results demonstrate that within the range of our study group there is no specific age or pubertal period that correlates to dramatic changes in the rotational profile, strength, or balance of the young female soccer player.

Poster 13

Type VII Fracture of the Lateral Malleolus in Children

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James G. Gamble, MD, PhD

Introduction: The authors present four cases of skeletally immature children with intra-epiphyseal Salter-Harris Type VII fractures of the distal fibula. They demonstrate radiographic features to differentiate a type VII fracture from an os fibulare and present the parameters of radiographic healing over time.

Methods: A retrospective case review was performed of four children with type VII intra-epiphyseal fractures. The mechanism of injury, presenting radiographs, treatment plans and outcomes were reviewed by the authors.

Results: Type VII fractures all occurred as a result of an acute inversion injury in skeletally immature children. Radiographs demonstrated a transverse, well differentiated fracture line through the epiphysis that did not involve the physis. The fracture was completely within the secondary center of ossification and the articular surface of the distal fibula with the talus remained intact. On the other hand, the os fibulare has smooth borders and is smaller than the fracture fragment. All fractures went on to full healing and normal, painless functioning with traditional treatment. No patients had a growth disturbance or articular problems.

Discussion and Conclusion: There are few reports in the literature concerning type VII intra-epiphyseal fractures of the fibula. This fracture is completely intra-epiphyseal, does not involve the physis, and is similar to a Weber A fracture of the distal fibula in an adult. Here we present the largest series to date of Type VII fractures of the fibula, discuss the differentiation from an os fibulare, and show that they heal with routine, nonsurgical management.

Poster 14

Spanning External Fixation for Open Joint Injuries in Pediatric Burns

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Matthew Comley, BS

Introduction: We report a case series on spanning external fixation for treatment of open joint burn injuries in a pediatric population.

Methods: We reviewed the case logs of all orthopedic surgeons from 2000 to 2010 at a burn hospital to identify pediatric 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; 7 flame, 2 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 7.1 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. There were 2 complications (22%) considered to be directly associated with the SEF procedure due to failure of fixation.

Conclusion and Discussion: 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 number of skin grafting procedures in this population.

SHOULDER

Poster 15

Tranexamic Acid Improves Post-Operative Hemoglobin Levels and Transfusion Rates in Shoulder Arthroplasty

Matthew D. Budge, MD
Tony Lin, MD

Introduction: Tranexamic acid (TXA) has been effective in decreasing blood loss and transfusion rates in hip and knee arthroplasty. However, there are no such studies on the use of TXA in shoulder arthroplasty (SA). The present study was designed to determine the effect of TXA on post-operative hemoglobin (Hb) levels and transfusion rates in patients undergoing primary shoulder arthroplasty.

Methods: Two cohorts of patients underwent retrospective chart review. From 2012-2013 patients undergoing primary SA did not receive TXA and were allotted to the control cohort. Patients undergoing SA from 2013-1014 were allotted to the TXA cohort. The TXA group received 1,000 mg of TXA intravenously just prior to incision and an additional 1,000 mg once the implants were placed. Baseline characteristics of both groups including age, sex, ASA grade, procedure, and preoperative Hb were recorded. Post-operative data collection included daily Hb levels (g/dl), thromboembolic events, transfusions, and number of days in hospital. Transfusions were per the American Association of Blood Banks guidelines.

Results: There were 22 patients in each cohort. There were no significant differences in baseline demographics or preoperative Hb between each group. Average decrease in Hb was 2.19 g/dl in the TXA group and 3.02 g/dl in the control group which was statistically significant. The decrease in Hb between preoperative and lowest recorded Hb was 2.39 g/dl for the TXA group and 3.29 g/dl for the control group which was statistically significant. There were no transfusions in the TXA group (0%) and two in the control group (9%). There were no thromboembolic events in either group. There was no significant difference in the length of stay between the two groups.

Discussion and Conclusion: Tranexamic acid use in shoulder arthroplasty is effective in improving post-operative hemoglobin levels and transfusion rates without evidence of increased thromboembolic complications.

Poster 16

The Evaluation and Classification of Spontaneous Shoulder Sepsis

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Anil Dutta, MD
Charles A. Rockwood Jr., MD

Background: Shoulder sepsis in the absence of previous invasive procedures is rare. To our knowledge, only one study has directly addressed shoulder sepsis without prior intervention [(1).] The purpose of our study was designed to evaluate our experience with spontaneous shoulder sepsis and develop a classification system and treatment algorithm based on the zones of involvement.

Methods: A retrospective chart review was performed to evaluate comorbidities, time to diagnosis, lab values, common pathogens, and number of/type of debridement. We used operative reports and MRI or CT scans to identify the zones of involvement and developed a classification system to help guide treatment of spontaneous shoulder infections.

Results: A total of 14 patients with 15 infected shoulders, average age 51 years (range 23-77), 10 male and 4 female patients (71% male), average time to diagnosis 18.5 days. Average leukocyte count 13.3 x 10^9 (range, 4-26.9). Mean ESR of 67 (range 33 - >120, nml 0-15). Mean CRP of 133mg/L (range 9.9 – 428 mg/dL, nml <10). Positive shoulder cultures were obtained in eleven patients. Five patients (46%) were found to have MRSA, four (36%) with MSSA, one (9%) with group B streptococcus, and one (9%) with group A streptococcus. Patients were treated with arthroscopic irrigation and debridement in one case, arthroscopic irrigation and debridement advanced to open arthrotomy in two cases and open arthrotomy in eleven cases. All patients were treated with intravenous antibiotics. A total of 42 operations were required on 15 infected shoulders (mean of 2.8 washouts per shoulder, range 1-8). The number of patients in each classification were as follows: Type I- 1, Type II-3, Type III-6, Type IV-5.

Conclusion: In our opinion a more accurate and consistent method of diagnosing and classifying septic arthritis of the shoulder is needed. By recognizing specific zones within the shoulder girdle where infection may be found and creating a classification system designed to help guide treatment based on these zones, we feel that the management of this complex disease will be improved.

Poster 17

Clinical Outcome of All-Suture Anchors in Arthroscopic Remplissage Shoulder Procedure

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Introduction: Remplissage is a technique in which the posterior capsule and the infraspinatus muscle are used to fill in Hill-Sachs defects. We report the first clinical series of remplissage with all-suture anchors.

Methods: A consecutive series of twelve patients with a history of dislocation that underwent arthroscopic stabilisation supplemented with remplissage were studied. They were assessed with the following scores: Constant, Rowe, Walch-Duplay, UCLA Shoulder rating, and Oxford instability. Student T-test was used for statistical analysis. Seven patients also had MRI assessment of their shoulders. The volume filled in the defect and anchor migration was measured.

Results: No patients had recurrent dislocations at an average follow up of fourteen months. There was significant improvement in the Oxford and Constant Score. The mean UCLA Score was 33.3 (35), Rowe and Walch-Duplay Score was 98.2 (100) and 92.7 (100) respectively. MRI scans showed the humeral head defect remained filled with soft tissue. The anchors remained in position in the humeral head without lucent around them.

Discussion and Conclusion: This study is the first to report successful outcome with the use of 1.4mm all-suture anchor for the remplissage procedure. MRI scans confirmed secure soft tissue fixation with no evidence of anchor migration.

SPINE

Poster 18

Investigating Cost Variation Within Spinal Fusion Payment Groups

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Introduction: Medicare reimbursement to hospitals is provided as a fixed payment for each admission based on Diagnosis Related Group (DRG). In 2005, a study of total joint arthroplasty (TJA) demonstrated that variation within DRGs can cause differences between hospital costs and Medicare reimbursement, resulting in predictable financial losses to hospitals and hindering access to care for some patients. Following this study, Medicare separated DRG 209 (which previously included all TJA procedures) into primary and revision TJA DRGs to reduce cost variation, establishing an effective "benchmark" for excessive variation. This study investigates cost variation within spinal fusion DRGs.

Methods: Data were obtained from the Nationwide Inpatient Sample (2011). We analyzed all hospital costs for patients in spinal fusion DRGs (453-460) and TJA DRGs (466-470). Our primary outcome was the coefficient of variation (CV), defined as the ratio of the standard deviation (SD) to the mean (CV=SD/mean x 100), for all costs within a given DRG. CVs were compared to the established "benchmark" of TJA "DRG 209" (aggregate of primary and revision DRGs [466-470]).

Results: In 2011, mean costs for spinal fusions ranged from $27,153 (SD = $11,992) for DRG 460 to $77,965 (SD = $41,044) for DRG 456. CV in spinal fusion costs ranged from 44.2 (DRG 460) to 52.6 (DRG 456). In contrast, the mean cost for the TJA benchmark "DRG 209" was $15,903 (SD = $6,077) with a CV of 38.2.

Discussion and Conclusion: In this study, variations in cost within each spinal fusion DRG were found to be higher than in the established TJA benchmark. As in TJA, this variation may be leading to differences between costs and reimbursement that compromise access to care. Future studies should seek to determine if changes can be made to further homogenize current payment groups and ensure equal access for all patients.

Poster 19

History of the X-Stop

Anthony Woodward, MD

Introduction: Initial studies reported good results after treatment of lumbar spinal stenosis with the X-Stop Interspinous Decompression System but other reports were less favorable. The authors of these reports do not explain the discrepancy. This study looks for possible reasons.

Methods: Published articles describing the result of implanting X-Stop are examined for actual outcomes and their validity, the pathology addressed with surgery, the length of follow-up, the year of the report, where the study was performed and its funding.

Results: Better results, fewer complications, and less secondary operations were reported in earlier studies, after operations performed in the US compared to those performed in Europe, and after operations performed at one particular facility. The preoperative condition of the patients affected the outcome. Beneficial effects appeared to deteriorate with time.

Discussion and Conclusion: This study suggests possible biases in the estimation of surgical success. The history of the X-Stop is similar to that of some other spinal procedures, including IDET, and the use of ADCON-L and of rhBMP. Understanding such history could provide future public benefit.

SPORTS MEDICINE

Poster 20

Meniscal Repair in a Young Athletic Population

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Introduction: Meniscal injury is a common knee injury in a young athletic population. Maintaining the integrity of the meniscus is critical to reducing contact pressures on the tibiofemoral articulation and reducing the degenerative cascade leading to osteoarthritis. The purpose of this study is to analyze the outcomes of meniscal repair in a young military athletic population, focusing on the patient's ability to remain on active duty.

Methods: A retrospective review of all meniscal repairs performed on active duty personnel at a Military Medical Center from January 2002 to December 2012 was conducted. Data were collected from operative reports, eprofile, and the electronic medical record (AHLTA).

Results: Two hundred thirty four active duty personnel, mean age 28 (19-48) years underwent 247 meniscal repairs during the study period. There were 175 meniscus tears repaired with an all inside technique with an average of 3 sutures, 37 repairs with inside out technique with an average of 8 sutures, 32 combined inside out and all inside repairs with an average of 6 sutures, and 3 outside in repairs. There were 95 bucket handle tears repaired with an average of 6 sutures. One hundred meniscal repairs were performed concurrently with an anterior cruciate ligament reconstruction, and 118 were isolated meniscal repairs. Postoperatively, 37 patients were medically separated from the military at an average time of 29.8 months. Fifty four patients required a permanent duty restricting profile. Ninety five patients required no permanent profile after meniscal repair at an average follow up of 5 (1.5-12.3) years. Forty four (19%) patients were lost to follow up.

Discussion and Conclusion: Meniscal repair in this young athletic military population allowed approximately 80% of

patients to return to military duties; however, 35% of those military personnel required a permanent duty restricting profile. Twenty percent of patients in this cohort required medical separation from the military after meniscal repair.

Poster 21

Effects of Prior Injury on Recruitment of NCAA Division I Athletes

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Introduction: The recruitment process of student-athletes in intercollegiate athletics is not fully understood and existing research on this topic is limited. A study by Rugg et al. has shown that athletes with prior injuries or surgeries have an increased likelihood of injury, surgery, and utilization of radiographic studies during their collegiate career. Given the potential impact of injury history on risk of recurrent injury as well as performance ability during subsequent athletic career, the current study aims to determine how injury history influences the recruitment and evaluation of incoming intercollegiate student-athletes.

Methods: IRB approval was obtained for the study. A questionnaire designed to ascertain recruitment data was developed using the online research-secure REDCap database. In total, 436 Division I athletic directors (ADs) and associates were invited to participate. The survey was e-mailed to participants.

Results: In total, 58 survey responses were collected from ADs. Of the 58 survey respondents, 39 ADs actively participate in the student-athlete recruitment process and 44 ADs reserve the right to overrule a coach on recruiting decisions. Student-athletes are required to have health insurance at 35 of the responding institutions. A pre-participation health history questionnaire inquiring about injury history is required of all athletes at 45 schools. Pre-participation physical examination of incoming athletes is required and performed by a university physician at 48 schools.

Conclusion: The increased risk for re-injury and further surgery associated with history of prior injury validates the importance of understanding the impact of injury history on the recruitment process of NCAA division I athletes. There is currently no consensus among athletic programs on student-athlete health insurance, pre-participation health history survey, and pre-participation screening with physical examinations. Athletic programs may benefit from using pre-participation health history surveys and pre-participation physical examinations as part of the recruitment process.

Poster 22

Prior Upper Extremity Surgery Impacts Injury Rates in Collegiate Athletes

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Introduction: Upper extremity surgeries are relatively common in adolescent athletes, but their impact on an athletic career is not well understood. The purpose of this study was to investigate the impact of prior upper extremity surgery on injury and surgery rates in Division I collegiate athletes.

Methods: All Division I athletes who began participation at a single institution from 2003 to 2009 were retrospectively identified. Pre-participation evaluation forms were used to distinguish athletes with prior upper extremity orthopaedic surgery, including shoulder, elbow, and wrist/hand surgery. Sport, seasons played, collegiate injuries, days missed, and college orthopaedic surgeries and diagnostic imaging were collected through sports archives, medical records, and the Sports Injury Monitoring System, and compared to athletes without a history of upper extremity surgery.

Results: Between 2003 and 2009, 1,145 athletes completed pre-participation evaluation forms. In total, 77 athletes (6.7%) had a history of upper extremity surgery prior to collegiate athletics, with rates highest in men's water polo, baseball, and football. Athletes with a prior upper extremity surgery experienced more upper extremity injuries in college (HR=4.127), and missed more days for upper extremity injuries per season compared to controls (16.5 vs. 6.7). Athletes with a prior shoulder surgery (n=20) had higher rates of upper extrem-

ity injury in college (HR=15,083), missed more total athletic days per season (77.5 vs. 29.8), had more MRIs (0.96 vs. 0.40), and underwent more total orthopaedic surgeries per season compared to controls (0.23 vs. 0.08).

Discussion and Conclusion: Collegiate athletes with a previous upper extremity surgery missed more days due to upper extremity injury in college. Those with prior shoulder surgery additionally received more diagnostic imaging and orthopaedic surgery in college. Given the observed increase in injury and surgery rates in this population, proactive management of collegiate athletes with a history of upper extremity surgery is paramount.

TOTAL JOINT ARTHROPLASTY

Poster 23

Immediate Weight Bearing for Osteoporotic Acetabular Fractures Managed with Acute Total Hip Arthroplasty

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Introduction: We investigated the clinical and functional outcome in osteoporotic patients with acetabular fractures (OTA 62A-C) treated with acute total hip arthroplasty using anti-protrusion cages or multi-holed trabecular metal who were allowed to fully weight bear immediately after surgery.

Methods: From 2008-2012, 8 patients (3 women and 4 men, 1 male to female transgender) with a median age of 71 (range 44-88) with displaced acetabular fractures were treated acutely with an anti protrusion cage or multi-holed trabecular metal cups and acute total hip arthroplasty by a single surgeon. All patients were allowed to weight bear immediately post-operatively. Harris Hip score were obtained for all patients during the month of May of 2012, with an average f/u of 36 months (range 16-54 months). Average radiographic followup was 13 months (range 0-35).

Results: The average Harris Hip score for 7 patients available for phone follow up was 80.67 (range 67.9-97). Postoperative complications included one hematoma not requiring drainage, heterotopic ossification causing hip ankylosis in one patient.

Conclusion: Geriatric patients and patients with compromised bone quality with acetabular fractures managed acutely with total hip arthroplasty can be allowed to weight bear as tolerated immediately after surgery with fair to excellent functional result. Additional prospective studies are needed to evaluate the role of THA.

Poster 24

Comparing Internet Resources for Knee Replacement and Shoulder Replacement Surgeries

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Introduction: Due to increasing accessibility, the Internet is becoming a go to source for medical information, and it is concerning that websites may have limited reliability and completeness to suit the needs of patients. The aim of this study is to compare and contrast the quality of information provided on the Internet for a more common surgery (total knee arthroscopy) with that of a less common surgery (total shoulder replacement).

Methods: In previous studies, the terms "total knee arthroplasty" and "total shoulder arthroplasty" were searched using common search engines and websites were evaluated using the DISCERN instrument. This data served as the basis for comparing TKA to TSA.

Results: TKA had an average overall DISCERN score of 2.20 (range 1-5), as opposed to 2.50 (range 1-5) for TSA. Only 31% (9/29) of websites for TKA vs. 38% (20/53) of websites for TSA, had a DISCERN score classified as "good" (≥3.00). TKA had 46.7% (28/60) non-commercial websites compared to 37% (33/90) for TSA. Google yielded 50% (10/20) non-commercial websites for TKA and 42% (13/30) for TSA, which was higher than any other search engine.

Conclusion: There are limitations to the majority of information found on the Internet for both TKA and TSA. However, there is no significant difference in the overall quality of information recovered between the two searches. Although there

are a number of "good" websites for information on TKA and TSA, these findings suggest that patients are left with the responsibility of sorting through the majority of "poor" information. Therefore, surgeons should be cognizant of the quality of patient-oriented information available on the Internet in order to better direct and facilitate patient education.

Poster 25

Preoperative Patient Reported Outcome Measures Predict Outcome Following UKA

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Background: Indications for unicompartmental knee arthroplasty (UKA) in isolated osteoarthritis of the knee remain controversial. Therefore, recognizing predictors of success following UKA are important for proper patient selection and the identification of modifiable determinants of outcome. The purposes of this study were to (1) determine whether preoperative patient reported health and function predict outcome following UKA and to (2) Identify which modifiable and non-modifiable factors affect outcome following UKA.

Methods: A prospective cohort of patients was analyzed from a community-based registry following unicompartmental knee arthroplasty. Analysis was conducted of the patients who had completed at least one subscale of the SF-36. Extensive descriptive statistics of characteristics and multivariate regression analysis were performed.

Results: Preoperative self reported bodily pain, physical function and general health predicted postoperative bodily pain and physical function at 2 years. BMI ≥30 and younger patient age were not associated with decreased patient reported outcomes following UKA.

Discussion and Conclusions: Preoperative patient reported outcome measures (PROMs) were reliable predictors of postoperative patient reported outcomes at two years. These outcomes a similar to research found in the total joint literature.

Poster 26

Can Tranexamic Acid Change Preoperative Anemia Management During Joint Arthroplasty?

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Introduction: Administration of tranexamic acid (TXA) decreases blood loss for patients undergoing surgery. However, the literature is limited about the efficacy and safety of TXA on patients with preoperative anemia. The purpose of this study was to compare transfusion and postoperative complication rates between anemic and nonanemic patients given TXA who underwent total hip arthroplasty (THA) and total knee arthroplasty (TKA).

Methods: A retrospective study was conducted of 182 primary arthroplasty cases. All patients received intravenous TXA during surgery. Anemia was defined as preoperative Hb of less than 12 g/dL for females and of less than 13 g/dL for males. Transfusion was directed by clinical and laboratory indications. Complications considered included thromboembolism, infection, and wound breakdown. The differences in transfusion and complication rates were compared between anemic and nonanemic cases.

Results: 22% of THA and 21% of TKA cases had preoperative anemia. There was no significant difference in transfusion rates between anemic and nonanemic THA and TKA cohorts. Similarly, there was no significant difference in complication rates between anemic and nonanemic THA and TKA cohorts.

Conclusion: TXA administration resulted in similar transfusion and complication rates, regardless of preoperative Hb, after joint arthroplasty. This may decrease the Hb threshold and increase the availability of these surgeries. Adjuvants given to increase Hb preoperatively may no longer be as necessary in the mildly anemic arthroplasty patient.

Poster 27

Can Urinary Catherization Be Avoided in Knee Replacement Based on Nocturia?

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Introduction: Urinary tract infection (UTI) is the most common postoperative complication following TJA in veterans. Limiting preoperative urinary catheterization could reduce postoperative UTI and accelerate mobilization. The purpose of this study was to determine whether a patient's self-reported frequency of nocturnal urination can be used as a screening tool to safely limit urinary catheterization prior to TKA.

Methods: This retrospective study evaluated male patients undergoing TKA at a single Veterans Affairs medical center. Prior to surgery, male patients were asked how many times they got up to urinate overnight. Patients reporting zero to one times did not get a urinary catheter. Patients reporting two or more times did get a urinary catheter. Charts were reviewed to determine whether patients required catheterization postoperatively, how long catheters were in place, and whether patients were discharged with a catheter.

Results: Of 84 patients, 41 reported urinating twice or more overnight, and had a urinary catheter placed. 43 patients reported urinating zero to one time per night, and did not have a catheter. Of these 43 patients, 7 patients (or 16%) required one straight catheterization post-operatively for urinary retention. No patient required multiple catheterizations. Of the patients who required a catheter, all were removed on postoperative day 1, and only one required replacement of a catheter after it was removed. No patient in either group was sent home with a catheter.

Discussion and Conclusion: We had previously been catheterizing every patient prior to total knee arthroplasty. In this all-male cohort, we were able to safely reduce our urinary catheterization rate to 49%. Using self-reported frequency of nocturnal urination appears to be an easy and effective screening tool to substantially reduce urinary catheterization rates in male TKA patients.

TRAUMA

Poster 28

Functional Outcomes After Headless Compression Screw Buried Fixation of Closed Patella Fractures

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Introduction: Traditional management of displaced patella fractures consists of cannulated screws or k-wires and a stainless steel wire. These methods have reliable healing rates however re-operation for hardware removal is high with an average rate of 33.6%. Since 2009 we have used a novel fixation method that minimizes the amount of prominent hardware through the use of buried compression screws and non-absorbable suture.

Methods: The charts of 14 patients with displaced patella fractures who were fixed using our technique between 2009-2013 were reviewed retrospectively. Patient functional outcome was assessed using the Short Form-12 (SF-12) and Kujala anterior knee scores. Demographic characteristics, postoperative complications, and rates of healing were recorded. Functional outcomes were compared to pooled results from a recent meta-analysis using a one-sample t-test for continues data. Re-operation rates were compared to pooled results from a recent meta-analysis using a Fischer exact test for binomial data. A p-value less than 0.05 was considered significant.

Results: Average length of follow up was 286 days. One of 14 patients required hardware removal (7%). When compared to the rate of re-operation previously reported (33.6%) there is a significantly lower rate of re-operation with our novel technique. There was no significant difference between the physical and mental functional outcomes (measured via SF-12 and SF-36 surveys) when comparing the survey results of our novel surgical technique (SF-12 PCS mean, 43.6; SD, 11.2; SF-12 MCS mean, 53.9; SD, 10.632) to the survey results of the traditional surgical technique (SF-36 PCS: mean, 40.9; SD, 10.003; SF-36 MCS: mean, 52.3; SD, 9.0035). The average Kujala score was 73.42 (range, 37-100; SD, 18.87; 95% CI, 61.43-85.40) with scores of 70 being considered to repre-

sent moderate disability. The average rate of healing time was 104.31 days (SD, 78.71). There were no infections or immediate post-operative complications.

Discussion and Conclusion: Buried compression screw and non-absorbable suture fixation is an effective and safe technique for management of displaced patella fractures and may reduce the need for future hardware removal.

Poster 29

Intramedullary Fixation of Subtrochanteric Femoral Fractures: A Retrospective Study of Standard Versus Cephalomedullary Nailing

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Introduction: Subtrochanteric femur fractures are often treated with cephalomedullary nails, but standard intramedullary nails may be sufficient to treat many subtrochanteric femur fractures. We performed a retrospective review to determine if it is mandatory to use fixation into the femoral head in intramedullary nailing treatment of subtrochanteric femur fractures with an intact lesser trochanter.

Methods: Our institutional trauma database was searched for all patients with proximal femur fractures. Inclusion criteria were fractures within 5 cm of the lesser trochanter that were treated with an intramedullary device in patients ages 18 – 84 years of age. Exclusion criteria were comminution involving the lesser trochanter, intertrochanteric fractures, use of a plate, or pathologic fractures. These patients were followed to union or nonunion and monitored for the need for revision surgery or complications. Union was determined defined as bridging callus on 3 of 4 cortices and painless ambulation.

Results: 50 patients with 52 subtrochanteric femur fractures met inclusion criteria, with 39 men and 11 women. Adequate follow-up to union or hardware failure was available in 39 fractures (75%). 13 fractures were treated with a standard, locked intramedullary nail, of which 9 had adequate follow-up (69%). All 9 fractures healed uneventfully. 39 fractures were treated with a cephalomedullary nail in 38 patients, of which 30 had adequate follow-up (77%). There were 2 nonunions that required revision surgery (5%). The follow up rate was 74%. There is no statistically significant difference between the two groups with respect to fracture union.

Discussion and Conclusion: Subtrochanteric femur fractures with an intact lesser trochanter can be successfully treated with standard locking nails. This study is underpowered to determine if standard locking or cephalomedullary locking is superior to the other, but all failures occurred in the cephalomedullary group.

Poster 30

RIA for Upper Extremity Nonunion and Segmental Bone Loss

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1) Nonunions continue to be a challenge. Smoking, diabetes, infection, open wounds and segmental bone loss all contribute to the development of nonunion. The use of the Reamer-Irrigator-Aspirator (RIA) system as an alternative to Iliac-Crest-Bone-Graft has become an attractive option, considering the pain and morbidity associated with ICBG, and biochemical and logistical benefits of RIA. To date, there are few reports of RIA use for upper extremity nonunions. 2) A single-institution retrospective review of 3 patients with humeral nonunions treated with autogenous bone graft obtained with the RIA system. Cases include a self-inflicted gun shot wound, a motor vehicle rollover, and an accidental fall. 3) Two of three cases were Gustillo grade 3A open fractures while the remaining case was a closed nonunion. RIA harvest was obtained by antegrade approach of the femur. All cases went on to bony union, as evidenced by bridging of the defect. 4) Though RIA has become more common among Orthopedic traumatologists, it is not commonplace among all Orthopedic surgeons, who may not be familiar with this newer technology. We have shown that RIA is an excellent option for nonunion of the humerus, particularly in the setting of segmental bone defects. Studies have shown that RIA provides a large harvest volume and offers less donor site morbidity than ICBG.

Poster 31

Functional Results of Transfemoral versus Through-Knee Amputation in Combat Injured Patients

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Introduction: The current conflicts in Afghanistan and Iraq have resulted in over 1,570 amputations and over 1,100 lower extremity amputations. When a below-knee amputation is not possible, a treating surgeon must choose between a through-knee (TKA) or transfemoral (TFA) amputation. The data comparing through-knee and transfemoral amputations is mixed. We hypothesized that through-knee combat-wounded amputees would have superior gait temporal-spatial parameters and lower mechanical work of ambulation than transfemoral amputees.

Methods: A retrospective review was performed to identify combat wounded amputees who had undergone unilateral through-knee amputations with complete gait data. These servicemembers were then matched to control transfemoral amputees. Gait temporal-spatial and mechanical work of ambulation were compared.

Results: Four combat wounded service members with unilateral through-knee amputations were identified, all had contralateral below-knee amputations. These patients were matched to four long transfemoral amputees (femoral length from ASIS 31-45cm) with similar height, body-mass index (BMI), and contralateral amputation level (all below-knee). There were no significant differences between the groups with regards to walking velocity, step width, step length, cadence, stride length, single limb support time, total stance time, force parameters or mechanical work of ambulation measure in Joules per kilogram per meter. During the data collection period, two through-knee amputees at our institution not included in the study population had elective conversion to transfemoral amputation at their request due to difficulty ambulating with asymmetrical knee centers.

Discussion and Conclusion: Gait parameters were similar in this group of combat wounded matched through-knee and transfemoral amputees. Through-knee amputees with intact contralateral knees have asymmetrical knee centers which can cause significant difficulty with walking and may drive them to pursue elective conversion to transfemoral amputation.

Poster 32

Spring Plate Fixation in Posterior Wall Acetabular Fractures — A Protocol for Use

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Introduction: The posterior wall is the most commonly fractured aspect of the acetabulum. Spring plates are commonly used in fixation of these fractures though not without risk. The purpose of this project is to propose a treatment protocol that will aid surgeons in deciding when a spring plate is a necessary adjunct in treatment of posterior wall acetabular fractures. In addition, we will review the outcomes of use of this protocol over a 2 year span at our institution.

Methods: A retrospective review was performed of all patients receiving surgery for treatment of a posterior wall, or associated transverse with posterior wall acetabular fracture by the senior author between February 2013 and December 2014. Medical charts were reviewed for demographics and patient information. Imaging was reviewed both preoperatively and postoperatively for injury characteristics and radiographic outcomes.

Results: Fifty eight patients were included in the study. Twenty six patients had transverse with posterior wall acetabular fractures. The other 32 patients had fractures of the posterior wall alone. Forty nine of the fractures were comminuted. Nine fractures had marginal impaction. Forty three patients initially had hip dislocations with 9 being irreducible. After operative treatment using the presented protocol, no recurrent dislocations were encountered. Spring plates were used in 7 cases. Reconstruction plates were used in all cases, with 43 cases using 2 reconstruction plates and 15 cases using 1 reconstruction plate. The average amount of displacement of the posterior wall component on computed tomography postoperatively was 2.27 mm (0.65-6.1) and the average amount of articular surface step off was 1.51 mm (0.39-3.63).

Four patients required secondary surgeries including two for postoperative infections, one for excision of heterotopic ossification, and one who eventually needed total hip arthroplasty. There were no instances of spring plate articular surface penetration. All patients were cleared to full weight bearing 12 weeks after their surgery date.

Conclusions: Spring plates are most commonly used for fixation of peripheral comminuted posterior wall acetabular fractures. There are several risks involved with the use of spring plates in this setting including articular surface penetration. In many cases, adequate fixation of posterior wall fractures can be performed without the use of spring plates. The presented protocol offers surgeons a protocol for deciding when spring plates must be used in fixation of posterior wall acetabular fractures and leads to good radiographic and clinical outcomes.

TUMOR

Poster 33

Distal Femur Compressive Osseointegration: Intermediate-Term Outcomes in Oncologic Patients

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Introduction: Compressive osseointegration is a novel modality for endoprosthetic distal femoral reconstruction. Currently the risk factors for mechanical failure and the incidence of rotational failure in the oncologic population are not known. The purpose of this study is to determine risk factors for mechanical failure and the incidence of rotational failure among patients treated with distal femoral compressive osseointegration endoprosthetic reconstruction for oncologic purposes.

Methods: Records from 100 consecutive endoprosthesis implantations in 94 patients following distal femoral tumor resection performed between March 1, 1996 and December 31, 2013 were retrospectively reviewed. Need for revision and cause of failure were abstracted from the medical record. Follow-up was for a minimum of 12 months or until implant removal; 45 patients were followed for greater than 5 years. Survival analysis was determined using the Kaplan-Meier log-rank technique. Risk factors for mechanical failure were determined using Cox Proportional Hazard modeling.

Results: Survival of the spindle at 5 and 10 years was 85.9% (95% CI 80.6%, 92.1%). The survival rate at 5 and 10 years for failures at the bone-prosthesis interface was 90% (95% CI 80.6%, 95.0%). Rates of rotational failure at 5 and 10 years were 4.1% (95% CI 2.5, 14.3%) and 11.6% (95% CI 4.2, 30.1%), respectively. There was a trend towards association between longer resection length and mechanical failure, HR 1.1 (95% CI 0.99, 1.2, p=0.07). Rotational failures comprised 26% of distal femoral mechanical failures, with 50% occurring within one year.

Discussion and Conclusion: Distal femoral implantations is a successful method for endoprosthetic reconstruction. Rotational failure is rare, with the majority occurring early. Longer resections are associated with a slightly increased risk of mechanical failure. More research is needed to evaluate methods of preventing mechanical and rotational failure.

Poster 34

Lower Extremity Sarcoma: Is Reconstruction Worth It?

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Introduction: Improved survival of extremity sarcoma patients has led to greater interest in limb salvage surgery. Plastic surgery reconstruction may allow for wider resection, thereby improving local-regional recurrence (LRR), but may be associated with increased complications and worse outcomes compared with primary amputation and limb salvage without reconstruction.

Methods: We queried the UCSF Cancer Registry database for patients treated at our institution for bone and soft tissue tumors of the distal lower extremity between 1993-2014. Patient demographics, tumor characteristics, involvement of plastic surgery for reconstruction, and adjuvant therapy were

reviewed. Post-operative complications, local-regional recurrence (LRR), reoperation or secondary amputation rates, and functional status were compared between primary amputation patients and those who underwent limb salvage with and without reconstruction.

Results: Fifty-one patients underwent limb salvage surgery, and 10 underwent primary amputation. Average age at diagnosis was 42.2 years (range 2-90). Twenty-one patients had plastic surgery reconstruction (9 skin grafts, 2 skin grafts + Integra, 1 local flap, 8 free flaps, 1 vascularized bone graft). Average post-resection defect size was significantly larger in reconstruction patients (86.0 cm2 vs 32.3 cm2). Three patients required secondary amputation (2 without reconstruction, 1 with skin graft). Median follow-up was 36.9 months. Rate of reoperation and LRR was not significantly different between cohorts, but reconstruction patients had increased risk of wound complications (RR= 3.62). There was a trend toward better functional outcomes after limb salvage without reconstruction, but these did not reach statistical significance.

Discussion and Conclusion: Patients who underwent resection with reconstruction had comparable functional capabilities as those undergoing primary amputation and resection alone, but a higher incidence of wound complications. Limb-salvage surgery, even with immediate plastic surgery reconstruction, provides acceptable oncologic outcomes for patients with distal lower extremity tumors.

Individual Orthopaedic Instruction/ Multimedia Education

Schedule:

Thursday, July 30, 2015	1:40 pm-4:00 pm
Friday, July 31, 2015	1:40 pm-4:00 pm
Saturday, August 1, 2015	3:25 pm-4:25 pm

The following AAOS videos 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; and 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. **Treatment of Femoro-Acetabular Impingement with Surgical Dislocation and Debridement in Young Adults** (22 minutes)
   Christopher L. Peters, MD and Jill A. Erickson, PA-C

4. **Basics of Computer Navigation in Total Knee Arthroplasty** (11 minutes)
   James B. Stiehl, MD

5. **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

6. **Arthroscopic Acetabular Labral Repair: Surgical Technique** (9 minutes)
   Marc J. Philippon, MD; Mike J. Huang, MD; Karen K. Briggs, MPH; and David A. Kuppersmith, BS

7. **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

8. **The Krukenberg Procedure for Children** (25 minutes)
   Hugh Godfrey Watts, MD; John F. Lawrence, MD; and Joanna Patton, ROT

9. **Single Incision Direct Anterior Approach to Total Hip Arthroplasty** (13 minutes)
   William J. Hozack, MD; Michael Nogler, MD; Javad Parvizi, MD; Eckart Mayr, MD; and Martin Krismer, MD

10. **Hip Arthroscopy: Operative Set-Up and Anatomically Guided Portal Placement** (8 minutes)
    Allston J. Stubbs, MD; Karen K. Briggs, MPH, MBA; and Marc J. Philippon, MD

11. **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

12. **Excision of Calcaneonavicular Tarsal Coalition** (7 minutes)
    Maurice Albright, MD; Brian Grottkau, MD; and Gleeson Rebello, MD

13. **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

14. **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

15. **Vertical Humeral Osteotomy For The Revision Of Humeral Components In Shoulder Arthroplasty** (21 minutes)
    Geoffrey Van Thiel, MD; Gregory P. Nicholson, MD; James P. Halloran, MD; Dana Piasecki, MD; Matthew T. Provencher, MD; and Anthony A. Romeo, MD

16. **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

17. **Reconstruction Of The Medial Collateral Ligament Of The Elbow** (12 minutes)
    James M. Bennett, MD; Thomas L. Mehlhoff, MD; and Rodney K. Baker

18. **Arthroscopic Management of Femoroacetabular Impingement** (12 minutes)
    J. W. Thomas Byrd, MD

19. **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

20. **Combined Cartilage Restoration and Distal Realignment for Patellar and Trochlear Chondral Lesions** (12 minutes)
    Peter N. Chalmers, MD; Adam B. Yanke, MD; Seth Sherman, MD; Vasili Karas, BS; and Brian Cole, MD, MBA

21. **Simple Arthroscopic Anterior Capsulo-Labral Reconstruction of the Shoulder** (17 minutes)
    Stephen J. Snyder, MD and Jeffrey D. Jackson, MD

22. **Proximal Humerus Resection for Parosteal Osteosarcoma** (16 minutes)
    Yvette Ho, MD; Camilo E. Villalobos, MD; and James C. Wittig, MD

23. **Biceps Tenodesis: Open Subpectoral and Arthroscopic Technique** (19 minutes)
    Adam B. Yanke, MD; Peter N. Chalmers, MD; Anthony A. Romeo, MD; Nikhil N. Verma, MD

24. **Total Shoulder Arthroplasty: Steps to Get it Right** (15 minutes)
Richard J. Hawkins, MD

25. **ACL Anatomic Single Bundle Reconstruction Technical Note and Results** (20 minutes)
Michael W. Moser, MD; Gonzalo Samitier Solis, MD; Terese L. Chmieleski, PT, PhD; Trevor Lentz, PT

26. **Surgical Repair of Proximal Hamstring Avulsion in the Athlete** (15 minutes)
Tal S. David, MD and Gabriel L. Petruccelli, MD

27. **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; Jason P. Hochfelder, MD

28. **Shoulder Arthrodesis: Surgical Technique** (11 minutes)
Ryan Warth, MD; and Peter J. Millett, MD, MSc

29. **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

30. **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

31. **Spine Scapular Non-Union ORIF Solution** (8 minutes)
Thomas W. Wright, MD; and Gonzalo Samitier Solis, MD, PhD

32. **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

33. **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

34. **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

35. **Transosseous Equivalent Pectoralis Major Tendon Repair** (8 minutes)
Kevin W. Farmer, MD and Gonzalo Samitier Solis, MD, PhD

36. **Posterolateral Corner Primary Repair And Reconstruction Case Based** (18 minutes)
Mark D. Miller, MD; Sean Higgins; and Brian C. Werner, MD

37. **Restoring the Natural Joint Lines & Knee Laxities Restores High Satisfaction in Kinematically Aligned TKA** (16 minutes)
Stephen M. Howell, MD; Joshua D. Roth; Harold G. Dossett, MD; and Maury L. Hull, PhD

38. **Rationale and Reliability of Setting I/E Component Rotation and Restoring Function in Kinematically Aligned TKA** (13 minutes)
Stephen M. Howell, MD; Alexander J. Nedopil, MD; and Maury L. Hull, PhD

39. **Navigated Total Knee Replacement with Robotic Assistance: A Surgical Technique Video** (18 minutes)
Jan A. Koenig, MD and Timothy Lozier, PA-C

40. **Surgical Management of Complex Metacarpophalangeal Joint Dislocation** (13 minutes)
Harold Fogel, MD; Matthew Hiro, MD; and Randipsingh R. Bindra, MD

41. **Minimally-Invasive Distal Radius Fixation: A Novel Technique** (9 minutes)
John S. Taras, MD

42. **Ulnar Collateral Ligament Repair Using Internal Brace Augmentation** (16 minutes)
Jeffrey R. Dugas, MD and Brian Walters, MD

43. **Arthroscopic Surgical Techniques for the Treatment of Femoroacetabular Impingement** (14 minutes)
Aaron J. Krych, MD; Paul L. Sousa, MBA; and Bruce A. Levy, MD

44. **Hip Arthroscopy: Pitfalls and Pearls** (15 minutes)
Scott D. Martin, MD

45. **Intra-Articular Glenoid Fracture: Open Reduction Internal Fixation** (13 minutes)
Michael J. Alaia, MD; Sanjit R. Konda, MD; Maxwell Weinberg, MD; and William Ryan, BS

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Western Orthopaedic Association

79th Annual Meeting

July 30 – August 1, 2015

The Coeur d'Alene Hotel
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☐ Video 7 (14 min)	☐ Video 16 (13 min)	☐ Video 25 (20 min)	☐ Video 34 (9 min)	☐ Video 43 (14 min)
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Western Orthopaedic Association

79th Annual Meeting

July 30 – August 1, 2015

The Coeur d'Alene Hotel
Coeur d'Alene, Idaho

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Wednesday, July 29, 2015

Session	Check if Attended	Presented objective balanced, & scientifically rigorous content	Achieved stated objectives	Satisfied my educational and/or professional needs
Sawbones Workshop	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*

Thursday, July 30, 2015

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*
General Session 2	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Concurrent PA Session 1	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Rapid Fire Session 3A Rapid Fire Session 3B Rapid Fire Session 3C Rapid Fire Session 3D	☐ ☐ ☐ ☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 4	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
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*

Friday, July 31, 2015

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 PA Session 2 General Session 6	☐ ☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Concurrent PA Session 3	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Rapid Fire Session 7A Rapid Fire Session 7B Rapid Fire Session 7C Rapid Fire Session 7D	☐ ☐ ☐ ☐	*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 3	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Symposium 4	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*

Saturday, August 1, 2015

Sessions	Check if Attended	Presented objective balanced, & scientifically rigorous content	Achieved stated objectives	Satisfied my educational and/or professional needs
General Session 9	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 10	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Concurrent PA Session 4	☐	*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 5	☐	*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*
Symposium 6	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
Rapid Fire Session 13A Rapid Fire Session 13B Rapid Fire Session 13C Rapid Fire Session 13D	☐ ☐ ☐ ☐	*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*

Western Orthopaedic Association

79th Annual Meeting

July 30 – August 1, 2015

The Coeur d'Alene Hotel
Coeur d'Alene, Idaho

2015 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.

2015 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 5.75 CME credits available during the course of the meeting for viewing posters (or a total of 23 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	
☐ 6	☐ 12	☐ 18	☐ 24	☐ 30	

Please indicate the poster(s) you found to be most meaningful and any comments. Begin with the poster number.

_____

_____

_____

_____

Please indicate any feedback that you may have concerning other posters. Begin with the poster number.

_____

_____

_____

_____

Please indicate any comments or suggestions that you have regarding the Poster Presentations.

_____

_____

_____

_____

2015 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: _____

_____

_____

2016 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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