Southern Orthopaedic Association

31st Annual Meeting

July 16-19, 2014

Beaver Creek Village

Avon, CO

Published by Data Trace Publishing Company

Exhibitor & Grantor Acknowledgements

The Southern Orthopaedic Association is grateful for the support of its educational grantors and exhibitors. Thank you for your participation and commitment to SOA.

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Southern Orthopaedic Association

31st Annual Meeting

July 16-19, 2014
Beaver Creek
Avon, Colorado

2014
Meeting Program

Chuck Freitag

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

Cynthia Lichtefeld

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

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Visit us at www.soaassn.org

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

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of the American Academy of Orthopaedic Surgeons and the Southern 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 27.75 *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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SOA President's Message

William C. Andrews Jr., MD

Dear Colleagues:

Peggy and I would like to welcome you to the 31st Annual Southern Orthopaedic Association meeting in Beaver Creek, Colorado. We are delighted that you and your family will be with us for what we know is going to be a tremendous academic and social program.

I would like to thank my good friend, Dr. Richard Moore for serving as my Program Chair. The scientific program is truly outstanding. There are 7 symposia on select hot topics in orthopaedic surgery, each of which has an outstanding presenting faculty. In addition, we had a very large number of abstract submissions and the academic papers are of a very high quality. Our Presidential Guest Speaker is Dr. James Urbaniak, renowned microvascular surgeon from Duke University. He has been my mentor throughout my orthopaedic career, and has taught countless orthopaedists both in our country and internationally.

Our Distinguished Orthopaedic Surgeon is Dr. C. Lowry Barnes, a nationally recognized total joint surgeon and a stalwart member of the Southern Orthopaedic Association as well as one of its past presidents. The social program truly offers something for everyone. We have multiple outdoor activities including mountain biking, hiking, fly fishing, and skeet shooting. There are also jeep tours and white water rafting opportunities. Through the concierge desk, there are other activities to explore as well.

The spouse's hospitality will include a presentation by The Red Tail Mountain Man about what it was like to live in the Rockies in the early 1800s. A rodeo will serve as our welcome reception, which I think is going to be fun for everyone involved. In lieu of black tie event on Saturday night, we are going to have a much less formal dinner in the center of town. Please feel free to bring your boots. If there are any questions, please do not hesitate to contact either myself or the SOA staff, Chuck, Stacy, Cynthia, Cindy Lee or Kaitlyn.

We look forward to seeing you in Colorado.

William C. Andrews Jr., MD

William C. Andrews Jr., MD

President, Southern Orthopaedic Association

Meeting Information

FORMAT

The educational sessions will be held Thursday, Friday, and Saturday, July 17-19, from approximately 6:30am until 1:30pm at The Park Hyatt Beaver Creek/Gerald Ford Hall in Avon, Colorado.

TARGET AUDIENCE

The 31st Annual Meeting of the Southern Orthopaedic Association has been developed primarily for orthopaedic and trauma surgeons. Physician Assistants, LPNs, and Physical Therapists would also benefit from this program.

SPEAKER READY ROOM

The Speaker Ready Room is available 24 hours a day. Please contact Hotel Security for access during unscheduled times. Must show ID/badge to be admitted after hours.

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. Place your ticket in the raffle box for a drawing 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.

PHYSICIAN REGISTRATION FEE

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

CME ACCREDITATION

The American Academy of Orthopaedic Surgeons designates this live activity for a maximum of 27.75 *AMA PRA Category 1 Credits*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

* 16.75 CME Credits for Scientific Program
* 4 CME Credits for Scientific Poster Sessions
* 7 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.soaassn.org to complete the SOA 2014 Annual Meeting CME Credit Records. CME certificates will be awarded to all registered participants.

MANAGEMENT

The Southern 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.

Table of Contents

Meeting-at-a-Glance

All rooms located in Gerald Ford Hall unless otherwise indicated.

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

WEDNESDAY, JULY 16, 2014

12:00pm–5:00pm	**Speaker Ready Room** *(Tabor Room)*
12:00pm–5:00pm	**Meeting Registration** *(Sawatch Registration Foyer)*
12:00pm–5:00pm	**Exhibit Setup** *(Mt. Jackson/Grouse Mountain Rooms)*
12:00pm–5:00pm	**Scientific Poster Setup** *(Heritage Hall Foyer)*
2:00pm–5:00pm	**SOA Board of Directors Meeting** *(Slate & Keller Rooms, located in Hyatt Hotel)*

THURSDAY, JULY 17, 2014

5:30am–6:15am	**SOA Councilors Meeting** *(Slate Mountain Room located in Hyatt Hotel)*
6:00am–1:30pm	**Speaker Ready Room** *(Tabor Room)*
6:00am–6:30am	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
6:00am–1:30pm	**Meeting Registration** *(Sawatch Registration Foyer)*
6:00am–1:30pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks and Daily Drawing** *(Mt. Jackson/Grouse Mountain Rooms)*
6:30am–6:45am	**First Business Meeting** *(McCoy's Peak Room)*
6:45am–1:30pm	**Scientific Sessions and Symposia** *(McCoy's Peak Room)*
8:30am–10:15am	**Spouse/Children's Hospitality** *(8100 Private Dining, located in Hyatt Hotel)*
9:50am–10:20am	**Presidential Guest Speaker** *(McCoy's Peak Room)*
11:30am–12:30pm	**Industry Sponsored Workshop Luncheon*** — **Cadence Pharmaceuticals, Inc. and ConvaTec** *(McCoy's Peak Room)* *CME credit not available
12:15pm–3:45pm	**Guided Jeep Tour** *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*
12:30pm–1:30pm	**Concurrent General Session** *(Heritage Hall)*
1:30pm–2:30pm	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
2:00pm–4:30pm	**Moderate Hike** (Approximately 5 miles) **Advanced Hike** (Approximately 6 miles) *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*
2:30pm–5:00pm	**Multimedia Education Session** *(Tabor Room)*

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

4:00pm–4:45pm	**New Member Reception** *(Suite # 3001, located in Hyatt Hotel)*
4:45pm–8:30pm	**Welcome Reception** *(Beaver Creek Rodeo; transportation from SOA hotels provided)*

FRIDAY, JULY 18, 2014

6:00am–6:30am	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
6:00am–7:00am	**Regional and AAOS President's Breakfast Meeting with State Presidents and Board of Councilors** *(Slate Mountain Room, located in Hyatt Hotel)*
6:00am–1:30pm	**Speaker Ready Room** *(Tabor Room)*
6:00am–1:30pm	**Meeting Registration** *(Sawatch Registration Foyer)*
6:00am–1:30pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks and Daily Drawing** *(Mt. Jackson/Grouse Mountain Rooms)*
6:30am–1:30pm	**Scientific Sessions and Symposia** *(McCoy's Peak Room)*
9:25am–9:35am	**Resident Awards** *(McCoy's Peak Room)*
9:40am–10:20am	**Presidential Address** *(McCoy's Peak Room)*
11:30am–12:30pm	**Industry Sponsored Workshop Luncheon* — Pacira Pharmaceuticals** *(McCoy's Peak Room)* *CME credit not available
12:30pm–1:30pm	**Concurrent General Session** *(Heritage Hall)*
1:00pm–5:00pm	**Fly Fishing** *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*
1:00pm–5:30pm	**Golf Tournament at EagleVail Golf Course** *(Meet at Course Pro Shop)*
1:30pm–2:30pm	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
1:30pm–5:00pm	**Guided Jeep Tour** *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*
2:30pm–5:00pm	**Multimedia Education Session** *(Tabor Room)*
5:30pm–7:30pm	**Exhibitor Reception** *(Mt. Jackson/Grouse Mountain Rooms)*
5:30pm–7:30pm	**Kid's Movie Party and Arts & Crafts** *(Heritage Hall)*

SATURDAY, JULY 19, 2014

6:00am–6:30am	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
6:00am–1:45pm	**Speaker Ready Room** *(Tabor Room)*
6:00am–1:45pm	**Meeting Registration** *(Sawatch Registration Foyer)*
6:00am–1:45pm	**Technical Exhibits, Continental Breakfast, Coffee Breaks and Daily Drawing** *(Mt. Jackson/Grouse Mountain Rooms)*
6:30am–1:45pm	**Scientific Sessions and Symposia** *(McCoy's Peak Room)*

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

9:40am–9:55am	**The J. Lorin Mason Jr., MD Inaugural Lecture** *(McCoy's Peak Room)*
10:00am–10:40am	**Distinguished Southern Orthopaedist** *(McCoy's Peak Room)*
12:00pm–6:00pm	**White Water Rafting - Shoshone Colorado** *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*
12:30pm–12:45pm	**Second Business Meeting** *(McCoy's Peak Room)*
12:45pm–1:45pm	**Concurrent General Session** *(Heritage Hall)*
1:00pm–5:00pm	**Bubba Armstrong Sporting Clay Tournament** *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*
1:00pm–6:00pm	**Rafting Float Trip — Upper Colorado** *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*
1:30pm–5:00pm	**Guided Jeep Tour** *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*
1:45pm–2:15pm	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
2:15pm–4:15pm	**Multimedia Education Session** *(Tabor Room)*
7:00pm–10:00pm	**Family Gala Dinner Dance** *(Beaver Creek Ice Rink)*

SUNDAY, JULY 20, 2014

8:00am–9:30am	**Fellowship and Worship** *(Slate & Keller Rooms, located in Hyatt Hotel)*

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

Scientific Program Agenda

Gerald Ford Hall — McCoy's Peak Room

(unless otherwise specified)

Presenters and times are subject to change.

THURSDAY, JULY 17, 2014

6:00am–6:30am	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
6:30am–6:45am	**First Business Meeting**
6:45am–6:50am	**Welcome, Introduction of Program and Announcements**
6:50am–7:40am	**General Session 1: Trauma**
7:40am–8:30am	**General Session 2: Pediatrics**
8:30am–8:50am	**Break — Please visit with exhibitors and posters** *(Mt. Jackson/Grouse Mountain Rooms)*
8:50am–9:40am	**Symposium 1: Trauma — The Humerus from Top to Bottom**
9:40am–10:20am	**General Session 3: OREF Report and Presidential Guest Speaker**
10:20am–10:40am	**Break — Please visit with exhibitors and posters** *(Mt. Jackson/Grouse Mountain Rooms)* Drawing will take place in the exhibit area at the end of the break.
10:40am–11:30am	**Symposium 2: Current Concepts in Foot and Ankle Surgery**
11:30am–12:30pm	**Industry Sponsored Workshop Luncheon — Cadence Pharmaceuticals, Inc. and ConvaTec** * CME credit not available
12:30pm–1:30pm	**Concurrent Session 4A: Arthroplasty I — Outcomes and Complications**
12:30pm–1:30pm	**Concurrent Session 4B: Spine** *(Heritage Hall)*
1:30pm–2:30pm	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
2:30pm–5:00pm	**Multimedia Education Session** *(Tabor Room)*

FRIDAY, JULY 18, 2014

6:00am–6:30am	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
6:30am–6:35am	**Announcements**
6:35am–7:25am	**General Session 5: Upper Extremity**
7:25am–8:15am	**General Session 6: Sports Medicine**
8:15am–8:35am	**Break — Please visit with exhibitors and posters** *(Mt. Jackson/Grouse Mountain Rooms)*
8:35am–9:25am	**Symposium 3: Injury in the Pediatric Athlete**

9:25am–10:20am	**General Session 7: Resident Awards, AAOS Report, and Presidential Address**
10:20am–10:40am	**Break — Please visit with exhibitors and posters** *(Mt. Jackson/Grouse Mountain Rooms)* The Drawing will take place in the exhibit area at the end of the break.
10:40am–11:30am	**Symposium 4: Current Controversies in Total Joint Arthroplasty**
11:30am–12:30pm	**Industry Sponsored Workshop Luncheon — Pacira Pharmaceuticals, Inc.** *CME credit not available
12:30pm–1:30pm	**Concurrent Session 8A: Foot & Ankle**
12:30pm–1:30pm	**Concurrent Session 8B: The Geriatric Patient** *(Heritage Hall)*
1:30pm–2:30pm	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
2:30pm–5:00pm	**Multimedia Education Session** *(Tabor Room)*

SATURDAY, JULY 19, 2014

6:00am–6:30am	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions
6:30am–6:35am	**Announcements**
6:35am–7:30am	**General Session 9: Arthroplasty II — Knee**
7:30am–8:25am	**General Session 10: Arthroplasty III — Hip**
8:25am–8:50am	**Break — Please visit with exhibitors and posters** *(Mt. Jackson/Grouse Mountain Rooms)* The drawing will take place in the exhibit area at the end of the break.
8:50am–9:40am	**Symposium 5: The Athlete's Hand**
9:40am–10:40am	**General Session 11: The J. Lorin Mason Jr., MD Inaugural Lecture and Distinguished Southern Orthopaedist**
10:40am–10:50am	**Break** *(Heritage Hall Foyer)*
10:50am–11:40am	**Symposium 6: Fractures in Kids You're Likely to See and Don't Want to Miss: A Case Based Approach to Diagnosis, Treatment, and Avoidance of Complications**
11:40am–12:30pm	**Symposium 7: Managing Complications in Total Joint Arthroplasty**
12:30pm–12:45pm	**Second Business Meeting**
12:45pm–1:45pm	**Concurrent Session 12A: Technology and Orthopaedics**
12:45pm–1:45pm	**Concurrent Session 12B: Basic Science** *(Heritage Hall)*
1:45pm–2:15pm	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions
2:15pm–4:15pm	**Multimedia Education Session** *(Tabor Room)*

Activities Information

Rooms located in Gerald Ford Hall unless otherwise indicated.

Badges or wristbands are required for admittance to all events.

Thursday, July 17, 2014

Spouse/Children's Hospitality
8:30am–10:15am *(8100 Private Dining)*

Join your friends and meet new spouses while enjoying a continental breakfast. Our guest speaker is The Red Tail Mountain Man. He will allow his audience to see, hear, feel, and smell what it was like to live in the Rockies in the early 1800s.

Price: ***Included in registration fee or $40 per unregistered adult guest; $20 per unregistered child (5-17 years)***

Industry Sponsored Workshop Luncheon — Cadence Pharmaceuticals, Inc. and ConvaTec
11:30am–12:30pm *(McCoy's Peak Room)*

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

- Peri–Operative Pain Management for Orthopaedic Surgery
- Changing Incidence of Arthroplasty and Burden of Infection, Risk Mitigation of Infection, and Recent Advances in Post–Operative Wound Management

**Not for CME Credit*

Price: ***Included in registration fee; lunch is provided***

Guided Jeep Tour
12:15pm–3:45pm *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*

Experience the magnificent Rocky Mountains at varied locations within the White River National Forest on one of the many customized, scenic Jeep tours. The knowledgeable Jeep Guides will take you to elevation heights of 12,000 feet in open-air Jeeps. With over 15 different trails to choose from, access to remote and scenic areas is unsurpassed by any other outfitter. The guides will offer great history of the area. Along the way you'll discover ghost towns, old mining claims, the biggest peaks in Colorado, and wildlife ranging from prairie dogs to moose and all sizes in between. Lunch not included.

Price: ***$74 per adult, $69 per child (8-12 years) (minimum 6 people)***

Moderate Hike (Approximately 5 miles)
2:00pm–4:30pm *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*

Along a backcountry trail where solitude and scenery prove magnificent, travel through pristine mountain landscapes as you discover the local wildlife in its natural environment. The Nature Guide will teach you about animal tracks, plant and forest communities, and local geology. Participants must wear close-toed shoes.

Price: ***$85 per person (minimum 6 people)***

Advanced Hike (Approximately 6 miles)
2:00pm–4:30pm *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*

Price: ***$85 per person (minimum 6 people)***

New Member Reception
4:00pm–4:45pm *(Suite # 3001, located in Hyatt Hotel)*

All SOA new members are invited to attend this reception. The SOA Board and Committee Members would like to take this opportunity to welcome you to the SOA.

Price: ***Included in registration fee***

Welcome Reception
4:45pm–8:30pm *(Beaver Creek Rodeo; transportation from SOA hotels provided)*

Have a kick-stomping good time at Beaver Creek's Rodeo — pony rides, face painting, bouncy house, mechanical bull and more! Sign up your child (ages 7-12 years) for a calf scramble in the rodeo ring. See which child will pull the ribbons from the calves and win a prize! Sidle up to our full bar and savor the best BBQ in Colorado.

Attire: Cowboy boots and jeans welcome

Price: ***Included in registration fee or $100 per unregistered adult guest; $50 per unregistered child (5-17 years)***

Calf scramble: $5.00 per child, must be pre-registered for this event

Friday, July 18, 2014

Industry Sponsored Workshop Luncheon — Pacira Pharmaceuticals, Inc.

11:30am–12:30pm *(McCoy's Peak Room)*

Post-Operative Pain Management with Exparel

**Not for CME Credit*

Price: Included in registration fee; lunch is provided

Fly Fishing

1:00pm–5:00pm *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*

Fly-fishing wade trips invigorate the fishing enthusiast! The bountiful rivers and streams of the region offer solace and satisfaction. Many of the areas designated for fishing have received the trophy-class Gold Medal, making them catch and release only. Visit local rivers and streams with a certified guide to learn or practice your technique. Brook, brown, cutthroat and rainbow trout are waiting for you to find them.

Price: $295 per person (minimum 2 people)

Golf Tournament at EagleVail Golf Course

1:00pm–5:30pm *(Meet at the Pro Shop)*

Tee time at 1:00 pm. Created by the Devlin/Von Hagge design team, EagleVail Golf club is full of elevation change and unique play. Elevated tees guarantee gravity-defying drives in the rarefied air, and, at 6,836 yards, beginners won't be intimidated and experienced golfers will be well-challenged. The front nine meanders through the valley floor, crossing the scenic Eagle River several times and the back nine winds up the mountain-side through aspen, lodgepole pine, and fir. The EagleVail Golf Club inhabits former verdant ranch and farm lands. Built in the early 1930s, the red barn near the Hole #2 green served as feed and tack storage, a testament to the valley's agricultural heritage.

15 minutes from hotel to course; transportation not provided.

Price: $185 per person (Includes greens fee, lunch and beverage cart)

Guided Jeep Tour

1:30pm–5:00pm *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*

Experience the magnificent Rocky Mountains at varied locations within the White River National Forest on one of the many customized, scenic Jeep tours. The knowledgeable Jeep Guides will take you to elevation heights of 12,000 feet in open-air Jeeps. With over 15 different trails to choose from, access to remote and scenic areas is unsurpassed by any other outfitter. The guides will offer great history of the area. Along the way you'll discover ghost towns, old mining claims, the biggest peaks in Colorado, and wildlife ranging from prairie dogs to moose and all sizes in between. Lunch not included.

Price: $74 per adult, $69 per child (8-12 years) (minimum 6 people)

Exhibitor Reception

5:30pm–7:30pm *(Mt. Jackson/Grouse Mountain Rooms)*

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

Attire: Business Casual

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

Kids' Movie Party and Arts & Crafts

5:30pm–7:30pm *(Heritage Hall)*

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 years)

Saturday, July 19, 2014

White Water Rafting — Shoshone Colorado

12:00pm– 6:00pm *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*

The Shoshone Rapids are one of the most scenic canyon rafting trips offered in Colorado. Carving their way through Glenwood Canyon, Shoshone Rapids offers a great blend of excitement and relaxation for the whole family. Get ready to paddle because you'll experience some great class III whitewater rapids right off the bat. Mellow out with some class II rapids and enjoy the beautiful canyon walls on both sides of the river.

One hour travel time between hotel and rapids. Lunch included.

*Depending on water run, rafting company might change trip

Price: $100 per adult, $94 per child (8-12 years) (minimum 8 people)

Bubba Armstrong Sporting Clay Tournament

1:00pm–5:00pm *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*

The 12-station sporting clay course has two throwers per station and is positioned in a world-renowned setting. It is one of the most scenic courses in North America. You tally your hits and misses as you move from station to station in groups of 1-4 people, very similar to a game of golf. Shotgun, ammo, 50 targets, eye and ear protection, transportation and lunch are included.

Price: $125 per person (minimum 14 people)

Rafting Float Trip — Upper Colorado

1:00pm–6:00pm *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*

A rafting float trip with light rapids on a beautiful and isolated section of the Colorado River. Rafting this portion of the Colorado River is suitable for the entire family. This mellow stretch of the River will allow you to relax and soak in all of the sights – you might even be able to take a dip along the way. Keep your eyes peeled for wildlife and remnants of old mining claims in the area.

Lunch not included.

*Depending on water run, rafting company might change trip.

Price: $74 per adult, $65 per child (8-12 years) (minimum 8 people)

Guided Jeep Tour

1:30pm–5:00pm *(Meet in Antler Hall Lobby, located in Hyatt Hotel)*

Experience the magnificent Rocky Mountains at varied locations within the White River National Forest on one of the many customized, scenic Jeep tours. The knowledgeable Jeep Guides will take you to elevation heights of 12,000 feet in open-air Jeeps. With over 15 different trails to choose from, access to remote and scenic areas is unsurpassed by any other outfitter. The guides will offer great history of the area. Along the way you'll discover ghost towns, old mining claims, the biggest peaks in Colorado, and wildlife ranging from prairie dogs to moose and all sizes in between. Lunch not included.

Price: $74 per adult, $69 per child (8-12 years) (minimum 6 people)

Family Gala Dinner Dance

7:00pm–10:00pm *(Beaver Creek Ice Rink)*

Looking at the stars, we will have an event to remember with a delicious meal, good company, and dancing music.

Attire: Mountain Fancy — Jeans, Jacket and Cowboy Boots Welcome!

Price: Included in registration fee or $150 for unregistered adult guest; $75 surcharge for registered child (5-17 years)

Sunday, July 20, 2014

Fellowship and Worship

8:00am–9:30am *(Slate & Keller Rooms, located in Hyatt Hotel)*

Grab your breakfast and then come join us for Sunday morning worship lead by John J. McGraw, MD.

Price: Included in registration fee

Parents/Guardians are responsible for their children at all of our functions.

* Call Concierge at 970-949-1234 ext. 51 for additional activities: ATV, Horseback Riding, Dog Sled Adventures, Mountain Biking, Tennis, Ice Skating, Miniature Golf, Bungee Trampoline, Wall Climbing, Hot Air Ballooning, Rock Climbing, and Zip Lining.

2013 - 2014 SOA Leadership

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2014 SOA New Active Members

We are pleased to welcome the following New Active Members to the Southern Orthopaedic Association:

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Tulsa, OK

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Carlos J. Lavernia, MD
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The Southern Orthopaedic Association is grateful for the support of its educational grantors and exhibitors. Thank you for your participation and commitment to the SOA.

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Shukla Medical
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Exhibitor/Grantor Information

American Academy of Orthopaedic Surgeons

6300 North River Road
Rosemont, IL 60018
847-823-7186
www.aaos.org

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America's Best Care Plus is an Accredited National Mail Order Compounding and Respiratory Pharmacy. Founded in 1997, and licensed in all 50 states, as well as the District of Columbia; we specialize in delivering medications to patients' doorsteps all across the United States. America's Best Care Plus' Compounding Program is ACHC Accredited and PCAB Accredited--an accreditation earned by only 2% of pharmacies in the United States. We specialize in compounding patient specific products for Topical Pain Control, Men and Women's Bioidentical Hormone Replacement, Skin Care and Scarring, Beauty & Lifestyle, and others. Our specialties include but are not limited to: Pain, Podiatry, Orthopedics/ Sports medicine, Family Medicine/Internal Medicine, OB/ Gyn, Pediatrics, Dermatology, Autism and many more. America's Best Care Plus want to help your patients to Live Life Better.

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Arthrex is a global leader in new product development and medical education in orthopaedics. With a corporate mission of helping surgeons treat their patients better, Arthrex has pioneered the field of arthroscopy and developed more than 6,000 innovative products and surgical procedures to advance minimally invasive orthopaedics worldwide. Arthrex is a privately held company, solely committed to delivering uncompromising quality to the healthcare professionals who use our products and the millions of patients whose lives we impact.

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BBL Medical Facilities specializes in planning, design, development and construction of medical facilities throughout the country. Headquartered in Albany, NY with a regional office in Charleston, WV, BBL provides real estate, financing and property management services with a guaranteed cost, occupancy date and exceptional quality.

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Biocomposites is a British biomaterials company that develops, manufactures and markets one hundred percent pure synthetic calcium based composite devices for bone regeneration. The company offers a full-line of FDA registered,

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Blue Star Radiology is a teleradiology company, owned and operated by The Dallas Cowboys. As the official radiologists of The Dallas Cowboys, we pride ourselves in providing world class diagnostic interpretations.

Cadence Pharmaceuticals

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Centura Health connects individuals, families and neighborhoods across Colorado and western Kansas with more than 6,000 physicians and 17,100 of the best hearts and minds in health care. Through our 15 hospitals, 6 senior living communities, health neighborhoods, physician practices and clinics, home care and hospice services, and Flight for Life® Colorado, we are making the region's best health care accessible and affordable in every community we serve.

CeramTec Medical Products

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CeramTec is the world's leading manufacturer of ceramic products for use in hip arthroplasty. It has been at the forefront in the development of innovative ceramic products that offer the highest reliability with the lowest articulation wear for Total Hip Replacement. Technological advances such as the introduction of our Alumina Matrix Composite (Biolox® delta) will further increase the reliability of our products. Over 10 Million Biolox® Components have been implanted around the world.

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ConforMIS develops and commercializes medical devices for the treatment of osteoarthritis and joint damage. The company's patented "Image-to-Implant"® technology enables the creation of customized patient-specific implants and instruments that are precisely sized and shaped to match the 3D topography of a patient's anatomy. To date, ConforMIS has developed a line of award winning personalized knee solutions to address all stages of osteoarthritis.

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DJO Global is a leading global medical device company providing solutions for musculoskeletal and vascular health, and pain management. The Company's products help patients prevent injuries or rehabilitate after surgery, injury or degenerative disease. DJO's brands include Aircast®, DonJoy®, ProCare®, CMF™, Empi®, Saunders®, Chattanooga Group™, DJO Surgical, Cefar-Compex® and Ormed®, Dr. Comfort, Bell Horn.

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352-377-1140
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Based in Gainesville, Fla., Exactech develops and markets orthopaedic implant devices, related surgical instruments and biologic materials and services to hospitals and physicians.

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MicroPort Orthopedics delivers the latest in orthopedic technologies and procedures for the repair and reconstruction of the hip and knee joint. At MicroPort Orthopedics, we aim to get patients back to a state of mobility that feels as natural as possible. We understand that we're only as good as the last patient experience. That's why we strive for an uncommon level of integrity. For us, that means relentlessly pursuing technical advances that keep us ahead of the market and you ahead of patient expectation. It means providing the most responsive reliable service to the healthcare community. Most of all, it means a complete commitment to getting the best possible results every time. You can depend on MicroPort Orthopedics to put integrity in motion.

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757-224-4990
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Smith & Nephew is a global medical technology business with global leadership positions in Orthopaedic Reconstruction, Endoscopy, Sports Medicine, Trauma Fixation, Extremities & Limb Restoration, and Advanced Wound Management. Visit www.smith-nephew.com for more information.

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Stryker is a leading medical technology company and together with our customers, we are driven to make healthcare better. Stryker offers innovative reconstructive, medical, surgical, neurotechnology, spine and robotic arm assisted technologies to help people lead more active, satisfying lives. We are committed to enhancing quality of care, operational effectiveness and patient satisfaction.

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510-249-2300
www.thinksurgical.com

Think Surgical is committed to the future of orthopaedic surgery and to improving patient care through the development of leading-edge precision technology. Think Surgical develops, manufactures, and markets an image-directed surgical system for orthopaedic surgery. The system includes two components: a 3D planning workstation for preoperative surgical planning of component selection, placement and surface preparation, and a computer assisted tool that executes the pre-surgical plan with unparalleled precision.

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Tornier's market-leading extremities products provide solutions for the shoulder, foot, ankle, hand, wrist, and elbow specialists. These products address a broad range of applications for joint reconstruction, trauma and osteosynthesis, biologic regeneration and repair, and sports medicine.

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VirtaMed, a Swiss-based company, develops virtual reality simulators of highest realism. These simulators provide teaching and training of diagnostic and therapeutic interventions in endoscopic surgery.

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SOA Business Meetings

Southern Orthopaedic Association

McCoy's Peak Room
Gerald Ford Hall
Avon, Colorado

Thursday, July 17, 2014

First Business Meeting

AGENDA

I. Call to Order, William C. Andrews Jr., MD
II. Approval of Minutes, Thursday and Saturday, July 18 and 20, 2013, Palm Beach, FL
III. Report of the President, William C. Andrews Jr., MD
  (a) Update on Association Status
  (b) Review of Annual Meeting Activities
  (c) Report on Actions of the Board of Trustees
  (d) Review of Future SOA Meetings
IV. Report of the Membership Chair, Samuel I. Brown, MD
V. Report of the Treasurer, Samuel I. Brown, MD
VI. Report of the Bylaws Chair, Andrew A. Shinar, MD
  (a) Presentation of Bylaws Changes
VII. Old Business
VIII. New Business
  (a) Presentation of 2014-2015 Slate of Nominees
  (b) Election of 2015 Nominating Committee Members at Large
IX. Announcements
X. Adjournment

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

Mediterranean Ballroom, The Breakers
Palm Beach, Florida
Thursday, July 18, 2013

CALL TO ORDER

Fred C. Flandry, MD, FACS, President, called to order the First Business Meeting of the Southern Orthopaedic Association. The meeting took place in the Mediterranean Ballroom, The Breakers, Palm Beach, Florida. The meeting began at 6:30 am.

APPROVAL OF MINUTES

A copy of the Minutes for the 2012 First and Second Business Meetings held at The Greenbrier, White Sulphur Springs, West Virginia, Thursday, July 19, 2012 were distributed for review and approval in the 2013 Meeting Program.

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

REPORT OF THE PRESIDENT

Dr. Flandry reported on the status of the SOA and reviewed the activities that will occur during the meeting. He stated the association is doing well fiscally and that this year's meeting is well attended. He briefly mentioned the SAE program, the Spouse Hospitality, the Exhibitors Reception and Silent Auction, the industry workshops and the Gala and encouraged everyone to attend these activities. Dr. Flandry concluded his report by announcing the 2014 Annual Meeting would be held in Colorado.

REPORT OF THE MEMBERSHIP CHAIR

Dr. Samuel I. Brown reported on the Councilors program and that it is the key to maintaining membership in SOA. He indicated that membership is down for the year and that programs have been put into place to address membership issues. Dr. Brown mentioned that Board and Councilor members will be promoting the Voucher Program for physicians and their families that have been in practice for one to five years which provides free registration for the meeting. SOA is also offering a certificate program which provides graduating residents with free registration to the Annual Meeting anytime during a three year period. Dr. Brown said that membership is a priority and focus for the association.

REPORT OF THE TREASURER

Mr. Chuck Freitag reported on the financial status of the Association. He related that membership revenue is down, but that SOA is projecting a profit of $101,000 for 2013 this compares to a profit of $170,000 in 2012. He stated that the Association had done a great job in recruiting exhibitors this year and thanked Dr. Fred Flandry for his help in this area. Mr. Freitag reviewed the Balance Sheet and said that the Association as of 6/30/2013 has total net assets of more than $767,000.

NEW BUSINESS

Dr. Flandry called on Dr. Moorman to present the Slate of Officers for 2014. Dr. Moorman informed the Membership that the Slate would be voted on at the Second Business Meeting and presented the following slate prepared by the SOA Nominating Committee:

President	William C. Andrews Jr., MD
President-Elect	Langdon A. Hartsock, MD
Secretary/Vice President	Darren L. Johnson, MD
Treasurer	Samuel I. Brown, MD
Two Trustees	Andrew A. Shinar, MD
	Jeffrey A. Guy, MD

Dr. Moorman stated that two members at large needed to be elected from the floor to serve on the 2014 Nominating Committee. The following members were nominated: Matthew Matava, MD and George Brindley, MD.

ACTION: It was moved and seconded to elect Matthew Matava and George Brindley to serve on the 2014 Nominating Committee. The motion carried.

ADJOURNMENT

There being no further business, Dr. Flandry adjourned the First Business Meeting at 6:45 am.

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

Mediterranean Ballroom, The Breakers
Palm Beach, Florida
Saturday, July 20, 2013

CALL TO ORDER

Fred C. Flandry, MD, FACS, President, called to order the Second Business Meeting of the Southern Orthopaedic Association. The meeting took place in the Mediterranean Ballroom, The Breakers, Palm Beach, Florida. The meeting began at 12:45 pm.

ELECTION OF OFFICERS AND TRUSTEES

Dr. Flandry presented for approval the proposed Slate of Officers and Board of Trustee Members for 2013-1014.

President	William C. Andrews Jr., MD
President-Elect	Langdon A. Hartsock, MD
Secretary/Vice President	Darren L. Johnson, MD
Treasurer	Samuel I. Brown, MD
Two Trustees	Andrew A. Shinar, MD
	Jeffrey A. Guy, MD

ACTION: It was moved and seconded that the 2013-2014 Slate be approved as presented. The motion carried.

2014 ANNUAL MEETING

Dr. Flandry invited everyone to Beaver Creek, Colorado for SOA's 31st Annual Meeting, July 16-19, 2014.

NEW BUSINESS

Dr. Moorman stated that on behalf of Dr. Andrews, who had to leave to catch an early flight, he would like to make one official presentation. Prior to making the presentation, he briefly related that the 2014 Annual Meeting would offer a rodeo, white water rafting and an exciting scientific program. Then, Dr. Moorman thanked Dr. Fred Flandry for a tremendous and wonderful job this year and presented him with the President's plaque for his efforts as President.

ADJOURNMENT

There being no further business, Dr. Flandry adjourned the Second Business Meeting at 12:55 pm.

Southern Orthopaedic Association

McCoy's Peak Room
Gerald Ford Hall
Avon, Colorado

Saturday, July 19, 2014

Second Business Meeting

AGENDA

I. Call to Order, William C. Andrews Jr., MD

II. Election of Officers and Trustees, William C. Andrews Jr., MD

President . . . . . Langdon A. Hartsock, MD
President-Elect. . . . . Darren L. Johnson, MD
Secretary/Vice-President . . . . . Samuel I. Brown, MD
Treasurer . . . . . Matthew J. Matava, MD
Trustees . . . . . Christopher A. Heck, MD
. . . . . Ryan M. Nunley, MD
Historian . . . . . C. Lowry Barnes, MD

III. Report of the 2015 Annual Meeting, July 15-18, The Grove Park Inn, Asheville, NC, Langdon A. Hartsock, MD

IV. Announcements

V. New Business

VI. Adjournment

Past Annual Meetings of the Southern Orthopaedic Association 1984–2014

First Annual Meeting

President:	Guy T. Vise Jr., MD
President-Elect:	Angus M. McBryde Jr., MD
Secretary-Treasurer:	William C. Collins, MD
Dates:	March 28-April 1, 1984
Location:	Cable Beach Hotel Nassau, Bahamas
Physician Attendance:	115
Guest Speakers:	William Enneking, MD *Gainesville, Florida* Wallace E. Miller, MD *Miami, Florida* Heinz Mittelmeier, MD *Homburg, West Germany*

Second Annual Meeting

President:	Angus M. McBryde Jr., MD
President-Elect:	J. Lorin Mason Jr., MD
Secretary-Treasurer:	William C. Collins, MD
Dates:	March 28-April 1, 1985
Location:	Frenchman's Reef Beach Resort Virgin Islands
Physician Attendance:	179
Guest Speakers:	PD Dr. med R.P. Jakob *Berne, Switzerland* Peter J. Fowler, MD *Ontario, Canada* Clement B. Sledge, MD *Boston, Massachusetts*

Third Annual Meeting

President:	J. Lorin Mason Jr., MD
President-Elect:	Kurt M. W. Niemann, MD
Secretary-Treasurer:	William C. Collins, MD
Dates:	May 28-June 1, 1986
Location:	The Homestead Hot Springs, Virginia
Physician Attendance:	112
Guest Speaker:	Mr. David J. Dandy *Cambridge, England*

Fourth Annual Meeting

President:	Kurt M. W. Niemann, MD
President-Elect:	William C. Collins, MD
Secretary-Treasurer:	Jack H. Henry, MD
Dates:	May 20-24, 1987
Location:	Southhampton Princess Hamilton, Bermuda
Physician Attendance:	151
Guest Speakers:	James Langston Hughes Jr., MD *Jackson, Mississippi* Robert G. Volz, MD *Tucson, Arizona*
First Distinguished Orthopaedist Award:	Wood W. Lovell, MD *Jacksonville, Florida*
Best Paper Award:	Michael Heckman, MD *Atlanta, Georgia*

Fifth Annual Meeting

President:	William C. Collins, MD
President-Elect:	J. Ollie Edmunds Jr., MD
Secretary-Treasurer:	Jack H. Henry, MD
Dates:	August 4-6, 1988
Location:	Caledonian Hotel Edinburgh, Scotland
Physician Attendance:	200
Guest Speakers:	Bryan Hurson, MD *Dublin, Ireland* James W. Harkess, MD *Louisville, KY* Mr. Douglas Lam *Edinburgh, Scotland* Professor Sean P. F. Hughes *Edinburgh, Scotland* Mr. David Dandy, FRCS *Cambridge, England* Brian Roper, FRCS *London, England* Michael Freeman, MD, FRCS *London, England* Basil Helal, MCh, FRCS *London, England* Mr. John King *London, England* Mr. Bill Grange *London, England*
Distinguished Orthopaedist Award:	J. Leonard Goldner, MD *Durham, North Carolina*
Best Paper Award:	Scott R. Grewe, MD *Atlanta, Georgia*

Sixth Annual Meeting

President:	J. Ollie Edmunds Jr., MD
President-Elect:	Jack H. Henry, MD

Secretary-Treasurer:	Owen B. Tabor Sr., MD
Dates:	May 3-7, 1989
Location:	Royal Antiguan Hotel Antigua, West indies
Physician Attendance:	152
Guest Speaker:	Professor Reinhold Ganz *Germany*
Distinguished Orthopaedist Award:	
	Alvin J. Ingram, MD *Jackson, Tennessee*
Best Paper Award:	D. F. Martin, MD *Baltimore, Maryland*

Seventh Annual Meeting

President:	Jack H. Henry, MD
President-Elect:	Owen B. Tabor Sr., MD
Secretary-Treasurer:	Lowell H. Gill, MD
Dates:	June 6-10, 1990
Location:	Hyatt Regency Hotel Maui, Hawaii
Physician Attendance:	186
Guest Speakers:	David S. Bradford, MD *Minneapolis, Minnesota* David P. Green, MD *San Antonio, Texas* William G. Hamilton, MD *New York,* New York Roby C. Thompson, MD *Minneapolis, Minnesota*
Distinguished Orthopaedist Award:	
	Jack C. Hughston, MD *Columbus, Georgia*
Best Paper Award:	Scott D. Boden, MD *Washington, DC*

Eighth Annual Meeting

President:	Owen B. Tabor Sr., MD
President-Elect:	Lowell H. Gill, MD
Secretary-Treasurer:	Albert H. Dudley III, MD
Dates:	August 8-10, 1991
Location:	The Broadmoor Colorado Springs, Colorado
Physician Attendance:	153
Guest Speakers:	Augusto Sarmiento, MD *Los Angeles, California* Michael A. R. Freeman, MD, FRCS *London, England*
Distinguished Orthopaedist Award:	
	Frank H. Stelling III, MD *Greenville, South Carolina*
Best Paper Award:	Mark R. Brinker, MD *New Orleans, Louisiana*

Ninth Annual Meeting

President:	Lowell H. Gill, MD
President-Elect:	Albert H. Dudley III, MD
Secretary-Treasurer:	Roger L. Mell, MD
Dates:	August 5-7, 1992
Location:	Chateau Whistler Resort Whistler, British Columbia
Physician Attendance:	167
Guest Speakers:	William R. Murray, MD *San Francisco, California* Michael Coughlin, MD *San Francisco, California* Paul Brand, MD *London, England*
Distinguished Orthopaedist Award:	
	William Fisher Enneking, MD *Gainesville, Florida*
Dow Corning-Allen Lacey, MD Endowment*:	
	Walker A. Wynkoop, MD *El Paso, Texas*

Tenth Annual Meeting

President:	Albert H. Dudley III, MD
President-Elect:	Eugene E. Taylor, MD
Secretary-Treasurer:	Edward E. Kimbrough III, MD
Dates:	August 12-14, 1993
Location:	Hotel Inter-Continental Vienna, Austria
Physician Attendance:	96
Guest Speakers:	Henry Bohlman, MD *Cleveland, Ohio* Anne Brower, MD *Bethesda, Maryland*
Distinguished Orthopaedist Award:	
	Thomas B. Dameron Jr., MD *Raleigh, North Carolina*
Dow Corning-Allen Lacey, MD Endowment*:	
	Deepak Bhatia, MD *Baltimore, Maryland*

Eleventh Annual Meeting

President:	Eugene E. Taylor, MD
President-Elect:	Edward E. Kimbrough III, MD
Secretary-Treasurer:	Neil E. Green, MD
Dates:	August 19-21, 1994
Location:	Southhampton Princess Southampton, Bermuda
Physician Attendance:	163
Guest Speakers:	James Andrews, MD *Birmingham, Alabama*

Distinguished Orthopaedist Award:
Lewis D. Anderson, MD
Mobile, Alabama
Wright Medical Technology-Allen Lacey, MD Endowment**:
O. Alton Barron, MD
New York, New York

Twelfth Annual Meeting

President:	Edward E. Kimbrough III, MD
President-Elect:	Neil E. Green, MD
Secretary-Treasurer:	J. F. Rick Hammesfahr, MD
Dates:	July 6-8, 1995
Location:	Chateau Frontenac Quebec City, Canada
Physician Attendance:	120
Guest Speakers:	Robert B. Salter, MD *Toronto, Canada* Henry J. Mankin, MD *Boston, Massachusetts*
Distinguished Orthopaedist Award:	Charles E. Epps, MD *Washington, DC*
Wright Medical Technology-Allen Lacey, MD Endowment**:	Randy Schwartzberg, MD *Orlando, Florida*

Thirteenth Annual Meeting

President:	Neil E. Green, MD
President-Elect:	J. F. Rick Hammesfahr, MD
Secretary/Vice-President:	John B. Gunn, MD
Treasurer:	Robert S. Adelaar, MD
Dates:	August 22-24, 1996
Location:	Sheraton Edinburgh Edinburgh, Scotland
Physician Attendance:	123
Guest Speakers:	Anthony Catterall, M.Chir., FRCS *London, England* Robert Neil Hensinger, MD *Ann Arbor, Michigan*
Distinguished Orthopaedist Award:	James R. Urbaniak, MD *Durham, North Carolina*
Wright Medical Technology-Allen Lacey, MD Endowment**:	Evan Ekman, MD *Hermosa Beach, California*

Fourteenth Annual Meeting

President:	J. F. Rick Hammesfahr, MD
President-Elect:	John B. Gunn, MD
Secretary/Vice-President:	W. Jason McDaniel Jr., MD
Treasurer:	Robert S. Adelaar, MD
Dates:	July 24-26, 1997
Location:	Inn at Spanish Bay Pebble Beach, California
Physician Attendance:	140
Guest Speakers:	Robert W. Jackson, MD *Dallas, Texas* Mr. Henri Landwirth *Orlando, Florida*
Distinguished Orthopaedist Award:	Thomas Whitesides Jr., MD *Atlanta, Georgia*
The HealthSouth Residents & Fellows' Award***:	D. Montgomery Hunter, MD *Winston Salem, North Carolina*

Fifteenth Annual Meeting

President:	John B. Gunn, MD
President-Elect:	W. Jason McDaniel Jr., MD
Secretary/Vice-President:	L. Andrew Koman, MD
Treasurer:	Robert S. Adelaar, MD
Dates:	July 30-August 1, 1998
Location:	Eldorado Hotel, Santa Fe New Mexico
Physician Attendance:	131
Guest Speakers:	Robert W. Jackson, MD *Dallas, Texas* William N. Capello, MD *Indianapolis, Indiana*
Distinguished Orthopaedist Award:	John A. Murray, MD *Houston, Texas*
The HealthSouth Residents & Fellows' Award***:	Douglas W. Lundy, MD *Atlanta, Georgia*

Sixteenth Annual Meeting

President:	W. Jason McDaniel Jr., MD
President-Elect:	L. Andrew Koman, MD
Secretary/Vice-President:	Robert S. Adelaar, MD
Treasurer:	Robert M. Peroutka, MD
Dates:	July 15-17, 1999
Location:	Ritz-Carlton Hotel Amelia Island, Florida
Physician Attendance:	171
Guest Speakers:	K. Donald Shelbourne, MD *Indianapolis, Indiana* Bradley K. Vaughn, MD *Raleigh, North Carolina*
Distinguished Orthopaedist Award:	Frank C. Wilson, MD *Chapel Hill, North Carolina*
The HealthSouth Residents & Fellows'Award***:	Robert E. Coles, MD *Durham, North Carolina*

Seventeenth Annual Meeting

President:	L. Andrew Koman, MD
President-Elect:	Robert S. Adelaar, MD
Secretary/Vice-President:	Riyaz H. Jinnah, MD
Treasurer:	Robert M. Peroutka, MD
Dates:	July 20-22, 2000
Location:	Southampton Princess Southampton, Bermuda
Physician Attendance:	137
Guest Speakers:	Jesse B. Jupiter, MD *Boston, Massachusetts* Andrew J. Weiland, MD *New York, New York* Panayotis Soucacos, MD, FACS *Ioannina, Greece*
Distinguished Orthopaedist Award:	Frank H. Bassett III, MD *Durham, North Carolina*

Eighteenth Annual Meeting

President:	Robert S. Adelaar, MD
President-Elect:	Riyaz H. Jinnah, MD
Secretary/Vice-President:	Champ L. Baker Jr., MD
Treasurer:	Robert M. Peroutka, MD
Dates:	July 19-21, 2001
Location:	Coeur d'Alene Resort Coeur d-Alene, Idaho
Physician Attendance:	110
Guest Speakers:	Michael J. Coughlin, MD *Boise, Idaho* Lamar L. Fleming, MD *Atlanta, Georgia*
Distinguished Orthopaedist Award:	John S. Gould, MD *Birmingham, Alabama*

Nineteenth Annual Meeting

President:	Riyaz H. Jinnah, MD
President-Elect:	Champ L. Baker Jr., MD
Secretary/Vice-President:	James H. Armstrong, MD
Treasurer:	Robert M. Peroutka, MD
Dates:	April 2-6, 2002
Location:	Excelsior/Grand Hotels Florence, Italy
Physician Attendance:	139
Guest Speakers:	Peter McLardy-Smith *Oxford, England* S. Michael Tooke, MD *Los Angeles, California*
Distinguished Orthopaedist Award:	David Hungerford, MD *Baltimore, Maryland*

Twentieth Annual Meeting

President:	Champ L. Baker Jr., MD
President-Elect:	James H. Armstrong, MD
Secretary/Vice-President:	Lamar L. Fleming, MD
Treasurer:	Robert M. Peroutka, MD
Dates:	July 30-August 3, 2003
Location:	The Burlington Hotel Dublin, Ireland (In conjunction with EOA)
Physician Attendance:	199
Guest Speakers:	Carlton G. Savory, MD *Columbus, Georgia* Steven P. Arnoczky, MD *East Lansing, Michigan*
Distinguished Orthopaedist Award:	David Sisk, MD *Memphis, Tennessee*

Twenty-first Annual Meeting

President:	James H. Armstrong, MD
President-Elect:	Lamar L. Fleming, MD
Secretary/Vice-President:	Robert M. Peroutka, MD
Treasurer:	John J. McGraw, MD
Dates:	July 21-24, 2004
Location:	The Westin Resort, Hilton Head Island, South Carolina
Physician Attendance:	172
Guest Speaker:	Dempsey S. Springfield, MD *New York, New York*
Distinguished Orthopaedist Award:	Charles A. Engh Sr., MD *Alexandria, Virginia*

Twenty-second Annual Meeting

President:	Lamar L. Fleming, MD
President-Elect:	Robert M. Peroutka, MD
Secretary/Vice-President:	George W. Brindley, MD
Treasurer:	John J. McGraw, MD
Dates:	August 3-6, 2005
Location:	The Grove Park Inn Asheville, North Carolina
Physician Attendance:	220
Guest Speaker:	Gary G. Poehling, MD *Winston Salem, North Carolina*
Distinguished Orthopaedist Award:	Charles A. Rockwood Jr., MD *San Antonio, Texas*
Harley and Betty Baxter Resident Paper Award Winners:	Christopher T. Donaldson, MD *Baltimore, Maryland* Matthew J. Hawkins, MD *Washington, DC*

Michael S. Wildstein, MD
Charleston, South Carolina

Twenty-third Annual Meeting

President: Robert M. Peroutka, MD
President-Elect: George W. Brindley, MD
Secretary/Vice-President: John J. McGraw, MD
Treasurer: Claude T. Moorman III, MD
Dates: July 19-22, 2006
Location: The Atlantis Resort
Paradise Island, Bahamas
Physician Attendance: 253
Guest Speaker: James R. Urbaniak, MD
Durham, North Carolina
Distinguished Orthopaedist Award:
Frank J. Frassica, MD
Baltimore, Maryland
Harley and Betty Baxter Resident Paper Award Winners:
Michael S. Shuler, MD
Atlanta, Georgia
Nathan A. Mall, MD
Durham, North Carolina
Jeffrey P. Garrett, MD
Winston-Salem, North Carolina

Twenty-fourth Annual Meeting

President: George W. Brindley, MD
President-Elect: John J. McGraw, MD
Secretary/Vice-President: James A. Nunley, MD
Treasurer: Claude T. Moorman III, MD
Dates: August 1-4, 2007
Location: The Fairmont Empress Hotel
Victoria, BC, Canada
Physician Attendance: 252
Guest Speakers: Robert H. Cofield, MD
Minneapolis, Minnesota
Distinguished Orthopaedist Award:
Richard J. Haynes, MD
Houston, Texas
Harley and Betty Baxter Resident Paper Award Winners:
Ajay Aggarwal, MD
Philadelphia, Pennsylvania
Daniel Del Gaizo, MD
Chapel Hill, North Carolina
Michael S. Shuler, MD
Atlanta, Georgia
Brett Sweitzer, MD
Atlanta, Georgia

Twenty-fifth Annual Meeting

President: John J. McGraw, MD
President-Elect: James A. Nunley, MD
Secretary/Vice-President: C. Lowry Barnes, MD
Treasurer: Claude T. Moorman III, MD
Dates: June 11-15, 2008
Location: The Homestead
Hot Springs, Virginia
Physician Attendance: 187
Guest Speaker: Peter Alexander Cole, MD
St. Paul, Minnesota
Distinguished Orthopaedist Award:
Champ L. Baker Jr., MD, FACS
Columbus, Georgia
Harley and Betty Baxter Resident Paper Award Winners:
Peter J. Apel, MD
Winston-Salem, North Carolina
Melvin D. Helgeson, MD
Washington, DC
Ryan U. Riel, MD
Jacksonville, Florida

Twenty-sixth Annual Meeting

President: James A. Nunley II, MD
President-Elect: C. Lowry Barnes, MD
Secretary/Vice-President: Paul F. Lachiewicz, MD
Treasurer: Claude T. Moorman III, MD
Dates: July 15-18, 2009
Location: Amelia Island Plantation
Amelia Island, Florida
Physician Attendance: 228
Guest Speaker: Professor Beat Hintermann, MD
Liestal, Switzerland
Distinguished Orthopaedist Award:
Robert S. Adelaar, MD
Richmond, Virginia
Harley and Betty Baxter Resident Paper Award Winners:
Daniel E. Davis, MD
New Orleans, Louisiana
Daniel S. Heckman, MD
Chapel Hill, North Carolina
William Reisman, MD
Athens, Georgia
Special Travel Grants:
Jonathan C. Barnwell, MD
Winston-Salem, North Carolina
John S. Shields, MD
Winston-Salem, North Carolina

Twenty-seventh Annual Meeting

President: C. Lowry Barnes, MD
President-Elect: Paul F. Lachiewicz, MD
Secretary/Vice-President: Claude T. Moorman III, MD
Treasurer: Frederick C. Flandry, MD
Dates: June 16-19, 2010

Location: El Conquistador Resort
Fajardo, Puerto Rico
Physician Attendance: 262
Guest Speaker: Thomas Parker Vail, MD
San Francisco, California
Distinguished Orthopaedist Award:
In Memory of Banks Blackwell, MD
Pine Bluff, Arkansas
Harley and Betty Baxter Resident Paper Award Winners:
Jonathan C. Barnwell, MD
Winston-Salem, North Carolina
John Gibbs, MD
Fort Worth, Texas
Morteza Meftah, MD
New York, New York
Haines Paik, MD
Washington, District of Columbia
Jason D. Rabenold, MD
San Antonio, Texas

Twenty-eighth Annual Meeting

President: Paul F. Lachiewicz, MD
President-Elect: Claude T. Moorman III, MD
Secretary/Vice-President: Frederick C. Flandry, MD, FACS
Treasurer: William C. Andrews Jr., MD
Dates: July 20-23, 2011
Location: Fairmont Orchid Hotel
Big Island, Hawaii
Physician Attendance: 166
Guest Speaker: Joshua J. Jacobs, MD
Chicago, Illinois
Distinguished Orthopaedist Award:
L. Andrew Koman, MD
Winston-Salem, North Carolina
Harley and Betty Baxter Resident Paper Award Winners:
Gregory P. Colbath, MD, MS
Charleston, South Carolina
Nathan A. Mall, MD
St. Louis, Missouri
Clinical Orthopaedic Society Resident Award Winners:
Brett Beavers, MD
Fort Worth, Texas
Adam M. Kaufman, MD
Durham, North Carolina
SOA Resident Award Winners:
Stephen Hamilton, MD
Atlanta, Georgia
Lt. Scott M. Tintle, MD
Washington, District of Columbia
Kyle E. Hammond, MD
Atlanta, Georgia

Twenty-ninth Annual Meeting

President: Claude T. Moorman III, MD
President-Elect: Frederick C. Flandry, MD, FACS
Secretary/Vice-President: William C. Andrews Jr., MD
Treasurer: Langdon A. Hartsock, MD
Dates: July 18-21, 2012
Location: The Greenbrier
White Sulphur Springs, West Virginia
Physician Attendance: 252
Guest Speaker: Richard J. Hawkins, MD
Greenville, SC
Distinguished Orthopaedist Award:
Angus M. McBryde Jr., MD, FACS
Columbia, SC
Harley and Betty Baxter Resident Award Winners:
Samuel Adams, MD
Durham, NC
Anil K. Gupta, MD, MBA
Durham, NC
SOA Presidents' Resident Award Winner:
Daniel G. Kang, MD
Bethesda, MD
SOA Resident Award Winners:
Lindsay Hickerson, MD
Richmond, VA
Maxwell K. Langfitt, MD
Winston-Salem, NC
SOA Resident Travel Grant Award Winners:
Melissa Bickett, MD
Lexington, KY
Juan S. Contreras, MD
Miami, FL
Phillip Horne, MD, PhD
Durham, NC
Jesus M. Villa, MD
Miami, FL

Thirtieth Annual Meeting

President: Frederick C. Flandry, MD, FACS
President-Elect: William C. Andrews Jr., MD
Secretary/Vice-President: Langdon A. Hartsock, MD
Treasurer: Darren L. Johnson, MD
Dates: July 17-20, 2013
Location: The Breakers
Palm Beach, Florida

Physician Attendance: 277
Guest Speaker: Congressman Thomas Price, MD
Atlanta, GA
Distinguished Orthopaedist Award:
James R. Andrews, MD
Gulf Breeze, FL
SOA Presidents' Resident Award Winner:
John S. Lewis Jr., MD
Durham, NC
Harley and Betty Baxter Resident Award Winners:
Joshua S. Griffin, MD
Temple, TX
Adam Sassoon, MD, MS
Orlando, FL
SOA/OREF Resident Award Winners:
Mihir J. Desai, MD
Atlanta, GA
Mark A. Tait, MD
Little Rock, AR
Robert Tracey, MD
Rockville, MD
SOA Resident Travel Grant Award Winners:
Michael Gottschalk, MD
Atlanta, GA
Kushal V. Patel, MD
Temple, TX
Elizabeth Polfer, MD
Bethesda, MD
Rabah Qadir, MD
New Orleans, LA

Thirty-First Annual Meeting

President: William C. Andrews Jr., MD
President-Elect: Langdon A. Hartsock, MD
Secretary/Vice-President: Darren L. Johnson, MD
Treasurer: Samuel I. Brown, MD
Dates: July 16-19, 2014
Location: Park Hyatt Beaver Creek
Avon, Colorado
Physician Attendance: TBA
Guest Speaker: James R. Urbaniak, MD
Durham, NC

Distinguished Orthopaedist Award:
C. Lowry Barnes, MD
Little Rock, AR
SOA Presidents' Resident Award Winner:
Travis Wilson, MD
Temple, TX
Harley and Betty Baxter Resident Award Winners:
Mathew J. Mazoch, MD
Little Rock, AR
Adam A. Sassoon, MD, MS
St. Louis, MO
Harley and Betty Baxter Resident Travel Grant Award Winner:
Matthew D. Laughlin, DO
El Paso, TX
SOA/OREF Resident Award Winners:
Brian E. Etier Jr., MD
Birmingham, AL
R. Andrew Henderson, MD, MSc
Durham, NC
Gregory S. Van Blarcum, MD
Bethesda, MD
SOA Resident Travel Grant Award Winners:
Christopher R. Jones, MD
Durham, NC
Lauren C. Leffler, MD
Greenville, SC
Scott C. Wagner, MD
Bethesda, MD

* Previously referred to as the "Best Paper Award"
** Previously referred to as the "Dow Corning-Allen Lacey, MD Endowment"
*** Previously referred to as the "Wright Medical Technology-Allen Lacey, M.D. Endowment"

Presidents' Gift Fund

$36,500

The SOA proudly acknowledges with sincere appreciation the following Past Presidents, Spouses, and Friends for their support of the Presidents' Gift Fund:

Robert S. Adelaar, MD
James H. Armstrong, MD
Champ L. Baker Jr., MD, FACS
C. Lowry Barnes, MD
George W. Brindley, MD
William C. Collins, MD
J. Ollie Edmunds, MD
Frederick C. Flandry, MD
L. Andrew Koman, MD
Paul F. Lachiewicz, MD
John J. McGraw, MD
Claude T. Moorman III, MD
James A. Nunley II, MD

The Harley and Betty Baxter Fund

$40,000

Out of the long-time friendship of Harley and Betty Baxter and the Southern Orthopaedic Association and its members, Mrs. Betty Baxter generously donated $20,000 to establish the Harley and Betty Baxter Fund which provides an award each year to three residents/fellows for excellence in research. Mrs. Baxter has continued to grow the Fund providing additional opportunities for the future. The SOA is humbled and appreciative of the generous gift from Mrs. Baxter and more importantly the wonderful relationship that all of its members have had over the years with the Baxters.

Harley Baxter served in the Marines from 1948-1952 and was wounded in Korea for which he received a Purple Heart. In the memory of his military service Betty Baxter has also generously donated additional funds to assist military participants to attend the meeting.

The J. Lorin Mason Jr., MD Lectureship

The J. Lorin Mason Jr., MD Lectureship has been created to celebrate Dr. Mason's contribution to the inception and continued success of The Southern Orthopaedic Association. He is a founding member and a Past President who has nurtured the concept of the exchange of free ideas between the community and academic communities. Dr. Mason was the first Orthopaedist in South Carolina to do operative arthroscopy of the knee. He practiced with Pee Dee Orthopaedic Associates in Florence, SC from 1967 to 1997, when he retired. He has been married to BeBe Mason for more than 50 years and they have three children, Snow, Elizabeth, and Julian. The funding for this lectureship has been made possible by an anonymous grant and the Board is hoping to raise more funds to establish an endowment. The lecture should cover a non-orthopaedic topic. The lecturer will be chosen and invited by the sitting President to present at the Annual Meeting as the Association's guest.

SOA Educational Program

The SOA Board created an Educational Program in which the Board pledged to participate 100%. The purpose of the Educational Program is to provide educational opportunities for our young orthopaedists by offering resident educational award opportunities throughout the Southern region.

To participate in this gift of stewardship and investment in the future of SOA Orthopaedic Resident Education, call or email Chuck Freitag with your commitment at 866-762-0730 or cfreitag@datatrace.com. The opportunity to contribute to the Educational Program is also available on your dues renewal notices.

Contributions to the SOA Educational Program may be tax-deductible. Contributions to the Educational Program will be used for educational purposes only and will not be included in SOA's operating revenue.

With Sincere Appreciation the following individuals are recognized for their support since the 2013 meeting in Palm Beach, Florida.

Diamond - $5,000 and above

C. Lowry Barnes, MD

Ruby - $1,000 to $4,999

William C. Andrews Jr., MD
Darren L. Johnson, MD
Matthew J. Matava, MD
Andrew A. Shinar, MD

Sapphire - $500 to $999

Samuel B. Adams Jr., MD
Samuel I. Brown, MD
Jeffrey. A. Guy, MD
Langdon A. Hartsock, MD
Spero G. Karas, MD
Ryan M. Nunley, MD
Ana K. Palmieri, MD
H.Clayton Thomason III, MD
Robert D. Zura, MD

Contributor

James G. Brooks Jr., MD
Richard S. Moore Jr., MD
Chitranjan S. Ranawat, MD

Southern Orthopaedic Association

Scientific Program

July 17-19, 2014

Beaver Creek
Avon, Colorado

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

2014 Program Chairman

Richard S. Moore, MD
Wilmington, NC

Dr. Richard Moore is a native of Eastern North Carolina and attended the University of North Carolina at Chapel Hill as both an undergraduate and medical student. He completed his residency at the Hospital of the University of Pennsylvania in Philadelphia before returning to North Carolina to complete a fellowship in Hand, Upper Extremity & Microvascular Surgery at Duke University. Following an AO Traveling Preceptorship in Pelvic & Acetabular Trauma, he joined the faculty of the Division of Orthopaedic Surgery at Duke where he served as the Director of the Orthopaedic Trauma Service and as a member of the Hand, Upper Extremity & Microvascular Reconstructive team.

He returned to Eastern North Carolina in 2000 and now practices at OrthoWilmington in Wilmington, NC. Dr. Moore, his wife Elizabeth, and their three children enjoy the coastal lifestyle in Wilmington and he feels very fortunate to be a Southern Orthopaedist.

2014 Presidential Guest Speaker

James R. Urbaniak, MD
Durham, NC

The Presidential Guest Speaker for the 2014 Annual Meeting is Dr. James R. Urbaniak, Past Chairman of Orthopedic Surgery at Duke University Medical Center in Durham, NC. Dr. Urbaniak received his medical degree in 1962 and completed his residency at Duke University Medical Center in Orthopaedics in 1969. He is renowned as a pioneer in replantation and microvascular reconstruction of injured extremities.

Dr. Urbaniak has held numerous national leadership positions in orthopaedic surgery, including serving as Chairman of the Board of Trustees for the *Journal of Bone and Joint Surgery* and as President of the American Society for Surgery of the Hand, the American Orthopaedic Association, and the American Board of Orthopaedic Surgery. He has contributed more than 45 book chapters to medical literature, edited 12 books, published more than 300 articles in medical journals and made over 400 presentations domestically and internationally. Dr. Urbaniak's primary areas of investigation include avascular necrosis of the femoral head, hand and upper extremity reconstruction, peripheral nerve repair and microsurgery.

Dr. Urbaniak has received numerous awards and honors including the SOA's Distinguished Southern Orthopaedist Award in 1996. He and his wife Muff have two children, Julie and Michael. We welcome him back to the podium for SOA's 2014 Annual Meeting and look forward to his presentation.

2014 Distinguished Southern Orthopaedist Award

C. Lowry Barnes, MD
Little Rock, AR

SOA is pleased to bestow its 2014 Distinguished Southern Orthopaedist Award to C. Lowry Barnes, MD, Professor of the Department of Orthopaedic Surgery at the University of Arkansas for Medical Sciences in Little Rock, AR. Dr. Barnes received his medical degree at the University of Arkansas College of Medicine in Little Rock in 1986. He completed his Orthopaedic Surgery Residency in 1991 and his Internship in 1987 at the University of Arkansas for Medical Sciences in Little Rock.

Dr. Barnes received a Certificate in Business Administration for Physicians in 1999 from Auburn University College of Business. He completed the John N. Insall Traveling Fellowship, an Adult Reconstructive Surgery/Arthritis Surgery Fellowship at Brigham & Women's Hospital/Harvard Medical School in Boston, MA and an AO/ASIF Adult Orthopaedic Fellowship at Inselspital in Bern, Switzerland.

Dr. Barnes has received numerous honors and awards and has published many articles and abstracts. He is currently President and Managing Partner of Arkansas Specialty Orthopaedics and belongs to many orthopaedic and medical associations and serves in a leadership capacity on many of their Boards and Committees. He is a Past President of the Arkansas Orthopaedic Society and the Southern Orthopaedic Association.

Dr. Barnes has participated in Operation Walk since 2007. He and his wife Tanya live in Little Rock and have three children, Emily, Chase and Sally. We congratulate Dr. Barnes on receiving this award and look forward to his presentation.

Past Recipients of the Distinguished Southern Orthopaedist Award

1987	Wood W. Lovell, MD	Jacksonville, FL
1988	J. Leonard Goldner, MD	Durham, NC
1989	Alvin J. Ingram, MD	Memphis, TN
1990	Jack C. Hughston, MD	Columbus, GA
1991	Frank H. Stelling III, MD	Greenville, SC
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2014 Resident/Fellow Award Winners

SOA Presidents' Resident Award
Travis Wilson, MD
Body Mass Distribution as a Significant Risk Factor for Complications After Total Hip Arthroplasty
Thursday, July 17, 2014, 12:42pm–12:48pm

Harley & Betty Baxter Resident Awards
Mathew J. Mazoch, MD
Diabetes, HgbA1c, and Complications in Revision Hip and Knee Arthroplasty
Thursday, July 17, 2014, 12:36pm–12:42pm

Adam A. Sassoon, MD, MS
Semi-Elective Treatment of Open Tibial Shaft Fractures with Intramedullary Nail Fixation and Primary Wound Closure, Is it Safe?
Thursday, July 17, 2014, 6:50am–6:56am

Harley & Betty Baxter Resident Travel Grant Award
Matthew D. Laughlin, DO
Enhanced Casualty Care from a Global Military Orthopaedic Teleconsultation Program
Saturday, July 19, 2014, 12:45pm–12:51pm

SOA/OREF Resident Awards
Brian E. Etier Jr., MD
Fracture Displacement and Neurological Injury in Supracondylar Humerus Fractures in Children
Friday, July 18, 2014, 6:35am–6:41am

R. Andrew Henderson, MD, MSc
Decreasing Incidence of Hip Fracture in the US Medicare Population, 2005-2011
Friday, July 18, 2014, 12:30pm–12:36pm

Gregory S. Van Blarcum, MD
Does Curve Magnitude/Deformity Correction Correlate with Pulmonary Function After Adult Deformity Surgery?
Thursday, July 17, 2014, 12:42pm–12:48pm

SOA Resident Travel Grant Awards
Christopher R. Jones, MD
Deltoid Ligament Repair Vs. Syndesmotic Fixation in Bimalleolar Equivalent Ankle Fractures
Friday, July 18, 2014, 12:48pm–12:54pm

Lauren C. Leffler, MD
Immobilization Versus Observation in Children with Toddler's Fractures: A Retrospective Review
Thursday, July 17, 2014, 7:40am–7:46am

Scott C. Wagner, MD
Outcomes of Single-Level Cervical Disc Arthroplasty Versus Anterior Cervical Discectomy and Fusion: A Single Center, Retrospective Review
Thursday, July 17, 2014, 12:36pm–12:42pm

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

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Marc F. Swiontkowski, MD *(3b. Eli Lilly- DSMB; 5. NIAMS/NIH; 7. Lippincott; 8. JBJS; 9. MAOA, TRIA Orthopaedic Center*)

Samuel K. Tabet, MD *(2. NuTech, Zimmer; 3b. Biomet, BioPoly, Genzyme, Zimmer; 5. Arthrex, Inc., Biomet, CONMED Linvatec, DePuy, Zimmer)*

Stephanie L. Tanner, MS *(n.)*

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

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Alison P. Toth, MD *(2. Genzyme, Tornier; 3b. Tornier; 5. Tornier; 6. Arthrex, Inc., Breg, DJ Orthopaedics, Mitek, Aircast(DJ), Stryker)*
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Gregory S. Van Blarcum, MD *(n.)*
Alexander R. Vap, MD *(n.)*
Jesus M. Villa, MD *(n.)*
Bradford S. Waddell, MD *(n.)*
Scott C. Wagner, MD *(n.)*
Brian R. Waterman, MD *(8. Arthroscopy Journal)*
Tyler S. Watters, MD *(n.)*
Samuel S. Wellman, MD *(5. Stryker, Zimmer, Biomet, DePuy; 8. Journal of Arthroplasty)*
Kenneth Wheeler, PhD *(n.)*

Kris Wheeler, MD *(n.)*
Bryan J. Whitfield, MD *(n.)*
Luke Wilcox, DO *(n.)*
Jeffrey Willey, PhD *(n.)*
S. Clifton Willimon, MD *(3b. Smith & Nephew Endoscopy)*
Glenn L. Wilson, PhD *(n.)*
Becky Wilson, BS *(3a. Synthes; 4. Johnson & Johnson)*
Travis Wilson, MD *(n.)*
Scott M. Wingerter, MD *(n.)*
Edward K. Wright Jr., PhD *(n.)*
Thomas W. Wright, MD *(1. Exactech; 3b. Exactech; 5. Exactech)*
Alan Y. Yan, MD *(n.)*
John M. Yanik, BS *(n.)*
Mae Young, MD *(n.)*
Joseph M. Zavatsky, MD *(1. Biomet; 3b. Amendia, DePuy, Biomet; 4. Innovative Surgical Solutions, Safe Wire)*
Nicole A. Zelenski, BS *(n.)*
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Robert D. Zura, MD *(3b. Smith & Nephew, Bioventus, Cardinal Health, Arthrex; 5. Synthes)*

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

Accreditation Information for the Scientific Program

PROGRAM COMMITTEE

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

Richard S. Moore, MD, *Chair*
L. Andrew Koman, MD
Lee R. Leedy, MD
Scott D. Mair, MD
Matthew J. Matava, MD

MISSION

The Southern Orthopaedic Association was founded in 1983 solely to develop and foster scientific medicine in the specialty of orthopaedic surgery. Annual meetings of the Association are dedicated to disseminating current clinical, research, and practice innovations in orthopaedic medicine.

PURPOSE

1. To provide the participants with an unbiased educational experience that will enable them to remain current in the general practice of orthopaedic surgery.
2. To provide the participants with an in-depth exposure to various subspecialty areas of orthopaedic surgery.
3. To provide participants with an opportunity to be exposed to leading orthopaedic advances.
4. To present a forum for an open exchange of ideas between the presenters, the faculty, and the participants through paper presentations, instructional courses, guest lectureships, symposia, multimedia educational sessions, and poster exhibits.

OBJECTIVES

Educational objectives will be met through a combination of paper presentations, lectures and workshops in plenary and specialty sessions allowing open discussion with the lecturers and paper presenters. The following objectives will be addressed during the Scientific Program, such that at the conclusion of this course the attendees should be able to:

1. Critically evaluate orthopaedic diseases and treatments through evidence based outcome presentations.
2. Discuss basic science and clinical study advances and their implications pertaining to the diagnosis and treatment of orthopaedic diseases.
3. Enhance and maximize clinical and operative skills in the management of new and leading technology in orthopaedic disorders.

These educational objectives will be obtained through paper presentations, guest lectureships, symposia, multimedia educational sessions, and poster exhibits.

SCIENTIFIC POSTER SESSIONS

Scientific Posters are an important feature of the SOA Annual Meeting. Posters will be on display each day of the Scientific Program and poster presenters will be available to answer questions before and after the Scientific Program Sessions. **Please note on the Scientific Program Schedule the designated times the poster presenters will be available for discussion.**

MULTIMEDIA EDUCATION SESSIONS

Multimedia education materials will be offered on Thursday, Friday, and Saturday, July 17-19, following the Poster Sessions. A comprehensive selection of AAOS DVDs will be available for your individual education.

CME ACCREDITATION

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of the American Academy of Orthopaedic Surgeons and the Southern 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 27.75 *AMA PRA Category 1 Credits*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

* 16.75 CME Credits for Scientific Program
* 4 CME Credits for Scientific Poster Sessions
* 7 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.soaassn.org to complete the SOA 2014 Annual Meeting CME Credit Records. CME certificates will be awarded to all registered participants.

CEC CREDIT

Physician's Assistants can receive up to 27.75 credit hours toward Continuing Education Credits. AAPA accepts American Medical Association Category I, Level 1 CME credit for the Physician's Recognition Award from organizations accredited by the ACCME.

CME NOTE

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

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

Program design is based on participants' responses from the last Annual Meeting and expressed educational goals of the SOA. 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 SOA Annual Meeting has been made available by the Southern Orthopaedic Association for educational purposes only. This material is not intended to represent the only, nor necessarily best, method or procedure appropriate for the medical situations discussed, but rather is intended to present an approach, view, statement, or opinion of the faculty which may be helpful to others who face similar situations.

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

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

FDA STATEMENT

Some pharmaceuticals or medical devices demonstrated at the SOA 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.

2014 Scientific Program

July 17-19, 2014
McCoy's Peak Room *(unless otherwise specified)*
Gerald Ford Hall, Avon, Colorado

Thursday, July 17, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 40-45.

6:00am–6:30am **Scientific Poster Session** *(Heritage Hall Foyer)*
Note: Presenters will be available to answer questions.

6:30am–6:45am **First Business Meeting**

6:45am–6:50am **Welcome, Introduction of Program and Announcements**
William C. Andrews Jr., MD, President
Richard S. Moore, MD, Program Chair

General Session 1: Trauma

Moderator: Marc F. Swiontkowski, MD

6:50am–6:56am **Harley & Betty Baxter Resident Award**
Semi-Elective Treatment of Open Tibial Shaft Fractures with Intramedullary Nail Fixation and Primary Wound Closure, Is it Safe?
Adam A. Sassoon, MD, MS, Orlando Regional Medical Center, Orlando, FL

6:56am–7:02am Epidemiology of Multiligamentous Knee Injuries and Associated Injuries: 10 Year Review at a Level 1 Trauma Center
Mark R. Elliott, MD, University of Florida Health, Jacksonville, Jacksonville, FL

7:02am–7:08am The Value of a Saturday Dedicated Orthopaedic Trauma Operating Room
Robert P. Runner, MD, Emory University/Grady Memorial Hospital, Atlanta, GA

7:08am–7:14am Degree of Joint Depression Predicts Meniscal Tear in Lateral Tibial Plateau Fractures
Cary Schwartzbach, MD, Inova Fairfax Hospital, Falls Church, VA

7:14am–7:20am Small Fragment Fixation of Bicondylar Tibial Plateau Fractures
Adam A. Sassoon, MD, MS, Orlando Regional Medical Center, Orlando, FL

7:20am–7:26am A Biomechanical Comparison of Calcium Phosphate and Fibular Allograft for Metaphyseal Bone Defect Management in Split Depression Tibial Plateau Fractures
Stuart M. Saunders, MD, Wake Forest University, Winston-Salem, NC

7:26am–7:32am Risk Factors for Infection in Tibia Plateaus with Compartment Syndrome
Jason A. Lowe, MD, The University of Alabama at Birmingham, Birmingham, AL
**Presented by Brian E. Etier Jr., MD*

7:32am–7:40am Discussion

General Session 2: Pediatrics

Moderator: Gregory A. Mencio, MD

7:40am–7:46am **SOA Resident Travel Grant Award**
Immobilization Versus Observation in Children with Toddler's Fractures: A Retrospective Review
Lauren C. Leffler, MD, Greenville Health System, Greenville, SC

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

Thursday, July 17, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 40-45.

7:46am–7:52am — Radius and Ulna Shortening Osteotomies with a Green Transfer for Pediatric Wrist Flexion Contracture
Donald C. Faust, MD, Southern Hand Specialists/Children's Hospital, New Orleans, LA

7:52am–7:58am — Circular External Fixation for Correction of Deformity in Blount Disease
Stephanie W. Mayer, MD, Duke University Medical Center, Durham, NC

7:58am–8:04am — Intermediate Results of the Bernese Periacetabular Osteotomy for the Treatment of Perthes-Like Hip Deformities
Stephen T. Duncan, MD, Washington University School of Medicine, St. Louis, MO

8:04am–8:10am — Early Complications in the First Year Following Posterior Spinal Fusion for Adolescent Idiopathic Scoliosis
F. Patterson Owings, MD, Children's Healthcare of Atlanta/Emory University, Atlanta, GA

8:10am–8:16am — Clinical Impact of Adopting a Novel Post-Operative Pathway on Hospital Stay Following Posterior Spinal Fusion for Adolescent Idiopathic Scoliosis
David E. Lazarus, MD, Emory University/Children's Orthopaedics of Atlanta/Children's Healthcare of Atlanta, Atlanta, GA

8:16am–8:22am — Children with Medicaid Requiring Spinal Fusion for Scoliosis Present with Larger Curves than Patients with Private Insurance
David E. Lazarus, MD, Emory University/Children's Orthopaedics of Atlanta/Children's Healthcare of Atlanta, Atlanta, GA

8:22am–8:30am — Discussion

8:30am–8:50am — **Break — Please visit with exhibitors and posters** *(Mt. Jackson/Grouse Mountain Rooms)*

Symposium 1: Trauma — The Humerus from Top to Bottom

Moderator: Robert D. Zura, MD

8:50am–8:57am — Soft Tissue Injuries of the Shoulder
Alison P. Toth, MD, Duke University Medical Center, Durham, NC

8:57am–9:04am — Proximal Humerus Fractures: Know Your Options
Grant Garrigues, MD, Duke University Medical Center, Durham, NC

9:04am–9:11am — All Shaft Fractures Should Be Plated
Robert D. Zura, MD, Duke University Medical Center, Durham, NC

9:11am–9:18am — All Shaft Fractures Should Be Nailed
Chetan Deshpande, MD, Mercer University School of Medicine Memorial University Medical Center, Savannah, GA

9:18am–9:25am — Fractures Associated with Nerve Injuries in the Humerus and Nerve Repair and Reconstruction
David S. Ruch, MD, Duke University Medical Center, Durham, NC

9:25am–9:32am — Elbow Fractures
Christopher S. Smith, MD, Naval Medical Center Portsmouth, Portsmouth, VA

9:32am–9:40am — Discussion

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

Thursday, July 17, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 40-45.

General Session 3: OREF Report and Presidential Guest Speaker

Moderator: William C. Andrews Jr., MD

9:40am–9:45am **OREF Report**
Frederick N. Meyer, MD, USA Orthopedics, Mobile, AL

9:45am–9:50am **Introduction of Presidential Guest Speaker**
William C. Andrews Jr., MD, Lynchburg, VA

9:50am–10:20am **Presidential Guest Speaker**
Relationships
James R. Urbaniak, MD, Durham, NC

10:20am–10:40am **Break — Please visit with exhibitors and posters** *(Mt. Jackson/Grouse Mountain Rooms)*

Symposium 2: Current Concepts in Foot and Ankle Surgery

Moderator: Mark E. Easley, MD

10:40am–11:30am Panel Discussion
Thomas O. Clanton, MD, The Steadman Clinic, Vail, CO
Mark E. Easley, MD, Duke University Medical Center, Durham, NC

11:30am–12:30pm **Industry Sponsored Workshop Luncheon— Cadence Pharmaceuticals, Inc. and ConvaTec** *CME credit not available

Concurrent Session 4A: Arthroplasty I — Outcomes and Complications *(McCoy's Peak Room)*

Moderator: David W. Romness, MD

12:30pm–12:36pm Medicaid Patients Have Inherently Higher in-Hospital Complication Rates and Costs After Primary Total Joint Arthroplasty
James A. Browne, MD, University of Virginia, Charlottesville, VA

12:36pm–12:42pm **Harley & Betty Baxter Resident Award**
Diabetes, HgbA1c, and Complications in Revision Hip and Knee Arthroplasty
Mathew J. Mazoch, MD, University of Arkansas for the Medical Sciences, Little Rock, AR

Concurrent Session 4B: Spine *(Heritage Hall)*

Moderator: Robert M. Peroutka, MD

12:30pm–12:36pm Operative Treatment of Combat-Related Spine Trauma (Crest) During the Conflicts in Iraq and Afghanistan
Scott C. Wagner, MD, Walter Reed National Military Medical Center, Bethesda, MD

12:36pm–12:42pm **SOA Resident Travel Grant Award**
Outcomes of Single-Level Cervical Disc Arthroplasty Versus Anterior Cervical Discectomy and Fusion: A Single Center, Retrospective Review
Scott C. Wagner, MD, Walter Reed National Military Medical Center, Bethesda, MD

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

Thursday, July 17, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 40-45.

Concurrent Session 4A *con't*

12:42pm–12:48pm	**SOA Presidents' Resident Award** Body Mass Distribution as a Significant Risk Factor for Complications After Total Hip Arthroplasty *Travis Wilson, MD, Scott and White Hospital/Texas A&M Health Science Center, Temple, TX*
12:48pm–12:54pm	Is Screening for Periprosthetic Joint Infections Using ESR and CRP per AAOS Clinical Guidelines Cost Effective? *Eric M. Greber, MD, St. Vincent Infirmary, Little Rock, AR*
12:54pm–1:00pm	Routine Intraoperative Cultures in Revision Joint Arthroplasty Surgery with Low Clinical Suspicion for Infection *Paul K. Edwards, MD, St. Vincent Infirmary, Little Rock, AR*
1:00pm–1:06pm	Wound Complications with Therapeutic Anticoagulation After Total Joint Arthroplasty *Ryan M. Nunley, MD, Washington University School of Medicine, St. Louis, MO*
1:06pm–1:12pm	Effect of Tranexamic Acid on Blood Utilization and Thromboembolic Events After Hip and Knee Surgery *Ryan M. Nunley, MD, Washington University School of Medicine, St. Louis, MO*

Concurrent Session 4B *con't*

12:42pm–12:48pm	**SOA/OREF Resident Award** Does Curve Magnitude/Deformity Correction Correlate with Pulmonary Function After Adult Deformity Surgery? *Gregory S. Van Blarcum, MD, Walter Reed National Military Medical Center, Bethesda, MD*
12:48pm–12:54pm	Comparison of Pulmonary Function in Adults Younger and Older than Age 60 Undergoing Spinal Deformity Surgery *Scott C. Wagner, MD, Walter Reed National Military Medical Center, Bethesda, MD*
12:54pm–1:00pm	Bilateral Pedicle Screw Fixation Provides Superior Biomechanical Stability in Transforaminal Lumbar Interbody Fusion: A Finite Element Study *Gregory S. Van Blarcum, MD, Walter Reed National Military Medical Center, Bethesda, MD*
1:00pm–1:06pm	Pedicle Screw Re-Insertion Using Previous Pilot Hole and Trajectory Does Not Reduce Fixation Strength *Scott C. Wagner, MD, Walter Reed National Military Medical Center, Bethesda, MD*
1:06pm–1:12pm	Lateral Lumbar Interbody Fusion for the Correction of Spondylolisthesis and Adult Degenerative Scoliosis in High-Risk Patients: Early Results and Complications *Bradford S. Waddell, MD, Ochsner Medical Center, New Orleans, LA*

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

Thursday, July 17, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 40-45.

Concurrent Session 4A *con't*

1:12pm–1:18pm	Differences Between Observed and Patient-Reported Functional Status Following Primary Total Joint Arthroplasty *A. Jordan Grier, BS, MS-IV, Duke University Medical Center, Durham, NC*
1:18pm–1:24pm	Patient Perceived Outcomes and Physical Performance in TKA *Jesus M. Villa, MD, Arthritis Surgery Research Foundation, South Miami, FL*
1:24pm–1:30pm	Discussion
1:30pm–2:30pm	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
2:30pm–5:00pm	**Multimedia Education Session** *(Tabor Room)*

Concurrent Session 4B *con't*

1:12pm–1:18pm	Incidence of Lumbar Plexopathy While Utilizing Mechanomyography (MMG) as an Alternative to Electromyography (EMG) for Trans-Psoas Lateral Lumbar Interbody Fusion (LLIF) *Brandon W. Cook, MD, Ochsner Medical Center, New Orleans, LA*
1:18pm–1:30pm	Discussion
1:30pm–2:30pm	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
2:30pm–5:00pm	**Multimedia Education Session** *(Tabor Room)*

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

Friday, July 18, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 40-45.

6:00am–6:30am **Scientific Poster Session** *(Heritage Hall Foyer)*
Note: Presenters will be available to answer questions.

6:30am–6:35am **Announcements**
Richard S. Moore, MD, Program Chair

General Session 5: Upper Extremity

Moderator: J. Mack Aldridge III, MD

6:35am–6:41am **SOA/OREF Resident Award**
Fracture Displacement and Neurological Injury in Supracondylar Humerus Fractures in Children
Brian E. Etier Jr., MD, University of Alabama at Birmingham, Birmingham, AL

6:41am–6:47am Aid to Reduction of Type 2 and 3 Supracondylar Elbow Fractures Using a Percutaneous Posterior Pin
Steve A. Lovejoy, MD, Vanderbilt Children's Hospital, Nashville, TN

6:47am–6:53am Distribution of the Volar and Dorsal Blood Supply of Lunate; An Anatomic Specimen Study of 1900 Lunate Bones
Navkirat S. Bajwa, MD, Case Western Reserve University, Cleveland, OH

6:53am–6:59am Effects of Upper Extremity Immobilization and Use of a Spinner Knob on Vehicle Steering
Lyle Jackson, MD, Greenville Health System, Greenville, SC

6:59am–7:05am Factors Affecting the Length of Stay After Shoulder Arthroplasty
Joseph J. King, MD, University of Florida, Gainesville, FL

7:05am–7:11am Clinical Outcomes of a Novel Figure-of-Eight Sternoclavicular Joint Reconstruction Technique
Jefferson Bradley Sabatini, MD, University of Alabama Birmingham, Birmingham, AL

7:11am–7:25am Discussion

General Session 6: Sports Medicine

Moderator: Frederick M. Azar, MD

7:25am–7:31am Multi-Rater Agreement of the Etiology of ACL Reconstruction Failure. A Radiographic and Video Analysis of the Mars Cohort
Matthew J. Matava, MD, Washington University School of Medicine, St. Louis, MO

7:31am–7:37am Pre-Operative Templating of Anterior Cruciate Ligament Reconstruction Using Lateral X-Ray to Prevent Graft Tunnel Mismatch
LCDR Patrick W. Joyner, MD, MS, Naval Medical Center Portsmouth Bone & Joint - Sports Medicine Institute, Portsmouth, VA

7:37am–7:43am Comparison of Clinical Testing and Functional Movement Testing in Patients Following Anterior Cruciate Ligament Reconstruction: Improving Return to Sport Guidelines
Stephanie W. Mayer, MD, Duke University Medical Center, Durham, NC

7:43am–7:49am Rates and Determinants of Return to Play After Anterior Cruciate Ligament Reconstruction in Division I College Soccer Athletes: A Study of the Southeastern Conference
Darren L. Johnson, MD, University of Kentucky, Lexington, KY

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

Friday, July 18, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 40-45.

7:49am–7:55am — Survivability of Surgical Repair & Recurrence of Shoulder Instability in a Young, Active Population
James H. Flint, MD, Walter Reed National Military Medical Center/ United States Naval Academy/United Stated Military Academy, Bethesda, MD
**Presented by CPT Adam M. Pickett, MD*

7:55am–8:01am — Biomechanical Comparison of Torque to Humeral Fracture Between Two Bony Biceps Tenodesis Locations
Arash A. Dini, MD, Tulane University School of Medicine, New Orleans, LA

8:01am–8:15am — Discussion

8:15am–8:35am — **Break — Please visit with exhibitors and posters** *(Mt. Jackson/Grouse Mountain Rooms)*

Symposium 3: Injury in the Pediatric Athlete

Moderator: S. Clifton Willimon, MD

8:35am–8:48am — Common Pediatric and Adolescent Athletic Hip Injuries
Henry B. Ellis, MD, Texas Scottish Rite Children's Hospital, Dallas, TX

8:48am–9:01am — Pediatric and Adolescent Foot and Ankle Injuries
Michael T. Busch, MD, Children's Healthcare of Atlanta & Children's Orthopaedics of Atlanta, Atlanta, GA

9:01am–9:14am — Pediatric and Adolescent ACL Update
S. Clifton Willimon, MD, Children's Healthcare of Atlanta & Children's Orthopaedics of Atlanta, Atlanta, GA

9:14am–9:25am — Discussion

General Session 7: Resident Awards, AAOS Report and Presidential Address

Moderator: Richard S. Moore, MD

9:25am–9:35am — **Resident Awards**
Richard S. Moore, MD, OrthoWilmington, Wilmington, NC

9:35am–9:40am — **AAOS Report**
Frederick M. Azar, MD, President, American Academy of Orthopaedic Surgeons

9:40am–9:45am — **Introduction of SOA President**
Richard S. Moore, MD, OrthoWilmington, Wilmington, NC

9:45am–10:20am — **Presidential Address**
William C. Andrews, Jr., MD, Lynchburg, VA

10:20am–10:40am — **Break — Please visit with exhibitors and posters** *(Mt. Jackson/Grouse Mountain Rooms)*

Symposium 4: Current Controversies in Total Joint Arthroplasty

Moderator: Michael P. Bolognesi, MD

10:40am–10:47am — Outpatient Arthroplasty
Michael E. Berend, MD, Franciscan/ St. Francis Health, Mooresville, IN

10:47am–10:54am — Pro-UKA
Michael P. Bolognesi, MD, Duke University Medical Center, Durham, NC

10:54am–11:01am — Pro-TKA
James A. Browne, MD, University of Virginia, Charlottesville, VA

11:01am–11:08am — Cross Linked Poly in TKA
Paul F. Lachiewicz, MD, Chapel Hill Orthopedics Surgery & Sports Medicine, Chapel Hill, NC

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

Friday, July 18, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 40-45.

11:08am–11:15am — Peri-Capsular Injection in Arthroplasty
C. Lowry Barnes, MD, Hip Knee Arkansas Foundation, Little Rock, AR

11:15am–11:22am — HXLPE in THA....Do We Really Need Any Future Advancements to This Bearing
Ryan M. Nunley, MD, Washington University School of Medicine, St. Louis, MO

11:22am–11:30am — Discussion

11:30am–12:30pm — **Industry Sponsored Workshop Luncheon — Pacira Pharmaceuticals, Inc.** *CME credit not available

Concurrent Session 8A: Foot & Ankle *(McCoy's Peak Room)*

Moderator: Mark E. Easley, MD

12:30pm–12:36pm — Tibiotalar Arthrodesis Takedown with Total Ankle Arthroplasty
Manuel J. Pellegrini, MD, Duke University Medical Center, Durham, NC

12:36pm–12:42pm — Comparison of Total Ankle Arthroplasty for End Stage Ankle Arthritis in Varus and Neutral Alignment
Alan Y. Yan, MD, Duke University Medical Center, Durham, NC

12:42pm–12:48pm — The Effect of Total Ankle Replacement on Energy Recovery During Walking
Robin M. Queen, PhD, Duke University Medical Center, Durham, NC

12:48pm–12:54pm — **SOA Resident Travel Grant Award** Deltoid Ligament Repair Vs. Syndesmotic Fixation in Bimalleolar Equivalent Ankle Fractures
Christopher R. Jones, MD, Duke University Medical Center, Durham, NC

Concurrent Session 8B: The Geriatric Patient *(Heritage Hall)*

Moderator: Valerae O. Lewis, MD

12:30pm–12:36pm — **SOA/OREF Resident Award** Decreasing Incidence of Hip Fracture in the US Medicare Population, 2005-2011
R. Andrew Henderson, MD, MSc, Duke University Medical Center, Durham, NC

12:36pm–12:42pm — Is the Treatment Practice for Femoral Neck Fractures in Medicare Patients Changing in the United States?
Tyler S. Watters, MD, Duke University Medical Center, Durham, NC

12:42pm–12:48pm — Repair of Intertrochanteric Hip Fracture: Cephalomedullary Nail Predominates Over Dynamic Hip Screw
Benjamin D. Streufert, BS, Duke University Medical Center, Durham, NC

12:48pm–12:54pm — Length-Stable Fixation of Femoral Neck Fractures with Fully Threaded Screws, Does It Work?
Adam A. Sassoon, MD, MS, Orlando Regional Medical Center, Orlando, FL
** Presented by Casey deDeugd, MD*

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

Friday, July 18, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 40-45.

Concurrent Session 8A *con't*

12:54pm–1:00pm	Trends & Demographics in Ankle Arthroscopy in the United States *Jonathan A. Godin, MD, MBA, Duke University Medical Center, Durham, NC*
1:00pm–1:06pm	Distribution of Subchondral Bone Strength in the Talus and Tibial Plafond: A Biomechanical Study *Slif D. Ulrich, MD, Medstar Union Memorial Hospital, Baltimore, MD*
1:06pm–1:12pm	The Effect of Retrograde Reaming for Tibiotalocalcaneal Arthrodesis on Subtalar Joint Destruction: A Cadaveric Study *Jason A. Lowe, MD, The University of Alabama at Birmingham, Birmingham, AL* **Presented by Paul C. Buzhardt, MD*
1:12pm–1:30pm	Discussion
1:30pm–2:30pm	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
2:30pm–5:00pm	**Multimedia Education Session** *(Tabor Room)*

Concurrent Session 8B *con't*

12:54pm–1:00pm	Intramedullary Nailing of Femoral Diaphyseal Metastases: Is It Really Necessary to Protect the Femoral Neck? *Bryan S. Moon, MD, MD Anderson Cancer Center, Houston, TX*
1:00pm–1:06pm	Role of Advanced Imaging in Evaluation of Post-Operative Delirium After Total Joint Arthroplasty *Bryce C. Allen, MD, Scott and White Memorial Hospital/Texas A&M University Health Science Center, Temple, TX*
1:06pm–1:12pm	Sex and Quality of Life in Patients Undergoing THA *Jesus M. Villa, MD, Arthritis Surgery Research Foundation, South Miami, FL*
1:12pm–1:18pm	The Radiographic Prevalence of Femoral Acetabular Impingement in Patients Undergoing Total Hip Arthroplasty at a Tertiary Referral Center *Kyle E. Fleck, MD, University of Florida Jacksonville, Jacksonville, FL*
1:18pm–1:30pm	Discussion
1:30pm–2:30pm	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
2:30pm–5:00pm	**Multimedia Education Session** *(Tabor Room)*

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

Saturday, July 19, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 40-45.

6:00am–6:30am **Scientific Poster Session** *(Heritage Hall Foyer)*
Note: Presenters will be available to answer questions.

6:30am–6:35am **Announcements**
Richard S. Moore, MD, Program Chair

General Session 9: Arthroplasty II — Knee

Moderator: Shawn B. Hocker, MD

6:35am–6:41am Extreme Variability in Posterior Slope of Proximal Tibia: Are We Accounting for Patients' Normal Anatomy in UKA?
C. Lowry Barnes, MD, Hip Knee Arkansas Foundation, Little Rock, AR

6:41am–6:47am The Impact of Patient Specific Guides and Mechanical and Kinematic Alignment on Patient Satisfaction and Function After TKA
Ryan M. Nunley, MD, Washington University Medical Center, St. Louis, MO/University of Wisconsin Survey Center, Madison, WI/Joint Implant Surgeons, New Albany, OH/Methodist Hospital of Sacramento, Sacramento, CA

6:47am–6:53am Irrigation and Implant Retention in Acute Knee PJI: Does It Work?
David A. Iacobelli, MD, Arthritis Surgery Research Foundation, South Miami, FL

6:53am–6:59am Potential Benefits of Using Liposomal Bupivacaine Instead of Epidurals in Total Knee Arthroplasty
Eric A. Heim, MD, St. Vincent Infirmary, Little Rock, AR

6:59am–7:05am Vitamin D Deficiency in Total Knee Replacement Surgery
Jesus M. Villa, MD, Arthritis Surgery Research Foundation, South Miami, FL

7:05am–7:11am Patient Satisfaction and Residual Symptoms Following TKR and PKR: What Do the Patients Say When We Aren't Around?
Ryan M. Nunley, MD, Washington University School of Medicine, St. Louis, MO/University of Wisconsin Survey Center, Madison, WI/Joint Implant Surgeons, New Albany, OH/Rush University Medical Center, Chicago, IL

7:11am–7:17am Self-Perceived Severity of Illness and Hospital Expenditures in Arthroplasty
David A. Iacobelli, MD, Arthritis Surgery Research Foundation, South Miami, FL

7:17am–7:23am Arthrofibrosis in Primary Total Knee Arthroplasty: The Role of Mental Health
Jesus M. Villa, MD, Arthritis Surgery Research Foundation, South Miami, FL

7:23am–7:30am Discussion

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

Saturday, July 19, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 40-45.

General Session 10: Arthroplasty III — Hip

Moderator: C. Lowry Barnes, MD

7:30am–7:36am — Intra-Operative Imaging Improves Leg Length Correction in Total Hip Arthroplasty, but Not Offset or Cup Inclination
Daniel R. Nelson, MD, Vanderbilt University Medical Center, Nashville, TN
**Presented by Andrew A. Shinar, MD*

7:36am–7:42am — Fixation, 15-Year Survival and Intraoperative Fracture with Monoblock Full-Coat Femoral Components in Revision Hip Arthroplasty
Paul F. Lachiewicz, MD, Chapel Hill Orthopedics Surgery & Sports Medicine, Chapel Hill, NC

7:42am–7:48am — Early Complications of Titanium Modular Neck Total Hip Arthroplasty
R. Andrew Henderson, MD, MSc, Duke University Medical Center/ Durham VA Medical Center, Durham, NC
**Presented by Erika L. Templeton, MD*

7:48am–7:54am — Chromium and Cobalt Levels and Associated MARS MRI Findings in Previously Unreported Design of Chrome Cobalt Modular Neck
Christopher T. Parks, MD, Hip Knee Arkansas Foundation, Little Rock, AR

7:54am–8:00am — Total Hip Arthroplasty in Patients 21 and Younger Using Highly Cross Linked Polyethylene: Excellent Survivorship at 5 Years
Adam A. Sassoon, MD, MS, Washington University School of Medicine, St. Louis, MO

8:00am–8:06am — Pain Patterns in Young, Active Patients Following Hip Arthroplasty
Ryan M. Nunley, MD, Washington University School of Medicine, St. Louis, MO/Cleveland Clinic, Cleveland, OH

8:06am–8:12am — Are the Range of Motion Measurements Needed When Calculating the Harris Hip Score?
Paul K. Edwards, MD, Duke University Medical Center, Durham, NC

8:12am–8:25am — Discussion

8:25am–8:50am — **Break — Please visit with exhibitors and posters**
(Mt. Jackson/Grouse Mountain Rooms)

Symposium 5: The Athlete's Hand

Moderator: Gary M. Lourie, MD

8:50am–9:30am — Panel Discussion
J. Mack Aldridge III, MD, Triangle Orthopaedics Surgery Center, LLC, Raleigh, NC
Gary M. Lourie, MD, The Hand & Upper Extremity Center of Georgia, Atlanta, GA
Richard S. Moore, MD, OrthoWilmington, Wilmington, NC
Diane E. Payne, MD, MPT, Emory University, Atlanta, GA

9:30am–9:40am — Discussion

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Saturday, July 19, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 40-45.

General Session 11: J. Lorin Mason Jr., MD Lecture & Distinguished Southern Orthopaedist

Moderator: William C. Andrews Jr., MD

9:40am–9:55am	**The J. Lorin Mason Jr., MD Inaugural Lecture** Raison D'etre and Consequences of Obamacare *Riyaz H. Jinnah, MD, Southeastern Orthopedics Center, Lumberton, NC*
9:55am–10:00am	**Introduction of Distinguished Southern Orthopaedist** *William C. Andrews, Jr., MD, Lynchburg, VA*
10:00am–10:40am	**Distinguished Southern Orthopaedist** Never Say Never: Unlikely Partners in Orthopaedics *C. Lowry Barnes, MD, Hip Knee Arkansas Foundation, Little Rock, AR*
10:40am–10:50am	**Break**

Symposium 6: Fractures in Kids You're Likely to See and Don't Want to Miss: A Case Based Approach to Diagnosis, Treatment, and Avoidance of Complications

Moderator: Gregory A. Mencio, MD

10:50am–11:30am	Panel Discussion *Robert D. Fitch, MD, Duke University Medical Center, Durham, NC* *Steve A. Lovejoy, MD, Vanderbilt Childrens Hospital, Nashville, TN* *Gregory A. Mencio, MD, Vanderbilt Childrens Hospital, Nashville, TN* *Christopher M. Stutz, MD, Vanderbilt Childrens Hospital, Nashville, TN*
11:30am–11:40am	Discussion

Symposium 7: Managing Complications in Total Joint Arthroplasty

Moderator: Ryan M. Nunley, MD

11:40am–11:49am	Failure of Metal-on-Metal THA *James A. Keeney, MD, Washington University School of Medicine, St. Louis, MO*
11:34am–11:58am	Peri-Prosthetic Infections *Greg G. Polkowski II, MD, Vanderbilt University Medical Center, Nashville, TN*
11:58am–12:07pm	Peri-Prosthetic Fractures *Stephen T. Duncan, MD, Washington University School of Medicine, St. Louis, MO*
12:07pm–12:16pm	Dislocations *Andrew A. Shinar, MD, Vanderbilt University Medical Center, Nashville, TN*
12:16pm–12:25pm	DVT/PE *Ryan M. Nunley, MD, Washington University School of Medicine, St. Louis, MO*
12:25pm–12:30pm	Discussion
12:30pm–12:45pm	**Second Business Meeting**

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

Saturday, July 19, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 40-45.

Concurrent Session 12A: Technology and Orthopaedics *(McCoy's Peak Room)*

Moderator: H. Clayton Thomason III, MD

12:45pm–12:51pm	**Harley & Betty Baxter Resident Travel Grant Award** Enhanced Casualty Care from a Global Military Orthopaedic Teleconsultation Program *Matthew D. Laughlin, DO, William Beaumont Army Medical Center, El Paso, TX*
12:51pm–12:57pm	Navigation in Total Hip Replacement: Is It Worth It? *David A. Iacobelli, MD, Arthritis Surgery Research Foundation, South Miami, FL*
12:57pm–1:03pm	The Reliability of Modern Alumina Bearings in Total Hip Arthroplasty *Gwo-Chin Lee, MD, University of Pennsylvania Medical Center, Philadelphia, PA*
1:03pm–1:09pm	New TKA Designs: Did the Patients Notice? *Ryan M. Nunley, MD, Washington University School of Medicine, St. Louis, MO/University of Wisconsin Survey Center, Madison, WI/Joint Implant Surgeons, New Albany, OH/Colorado Joint Replacement, Denver, CO/Rush University Medical Center, Chicago, IL*
1:09pm–1:15pm	Smartphone-Based Goniometers Versus Standard Goniometers: Accuracy in a Clinical Setting *Bradford S. Waddell, MD, Ochsner Medical Center, New Orleans, LA*

Concurrent Session 12B: Basic Science *(Heritage Hall)*

Moderator: Samuel I. Brown, MD

12:45pm–12:51pm	Use of a Concentrated Bone Marrow Aspirate for Nonunions and Bone Defects of the Femur and Tibia *Robert D. Zura, MD, Duke University Medical Center, Durham, NC* **Presented by Alexander R. Vap, MD*
12:51pm–12:57pm	The Use of Human Amniotic Membrane for Cartilage Repair: A Sheep Study *David M. Conner, MD, New Mexico Orthopaedic Associates, Albuquerque, NM* **Presented by Davis Guebert, BS*
12:57pm–1:03pm	Decreased T2 Relaxation and Calcification in Rat Knee Articular Cartilage Following Modelled Therapeutic Irradiation at Long-Term Followup *Ian Hutchinson, MD, Wake Forest School of Medicine, Winston-Salem, NC*
1:03pm–1:09pm	Biomechanical Tensile Strength Analysis of Current Techniques for Medial Patellofemoral Ligament Reconstruction *LCDR Patrick W. Joyner, MD, MS, Andrews Institute for Orthopaedics & Sports Medicine, Gulf Breeze, FL*
1:09pm–1:15pm	Mini-Plating Can Influence Compression Achieved in Long Bone Fracture Fixed with Dynamic Compression Plating (DCP) *Cary Schwartzbach, MD, Inova Fairfax Hospital, Falls Church, VA*

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

Saturday, July 19, 2014

(Presenters and times are subject to change.)
Disclosure Information is listed on pages 40-45.

Concurrent Session 12A *con't*

1:15pm–1:21pm	Radiation Exposure to the Orthopaedic Surgeon and Efficacy of a Novel Radiation Attenuating Product *Emily Mayekar, MD, University of Illinois at Chicago, Chicago, IL*
1:21pm–1:27pm	Technological Advances: The Learning Curve Effect *David A. Iacobelli, MD, Arthritis Surgery Research Foundation, South Miami, FL*
1:27pm–1:33pm	Outpatient Joint Replacement: Trends in the Nationwide Private Payer Sphere *Tyler S. Watters, MD, Duke University Medical Center, Durham, NC*
1:33pm–1:45pm	Discussion
1:45pm–2:15pm	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
2:15pm–4:15pm	**Multimedia Education Session** *(Tabor Room)*

Concurrent Session 12B *con't*

1:15pm–1:21pm	Association of Ulnar Variance with Lunate Morphology; An Anatomic Specimen Study of 630 Human Cadaveric Wrists *Navkirat S. Bajwa, MD, Case Western Reserve University, Cleveland, OH*
1:21pm–1:27pm	The Dilution Effect of Intra-Articular Injection Administered After Knee Arthroscopy *Stephanie S. Stopka, BS, University of South Alabama College of Medicine, Mobile, AL*
1:27pm–1:33pm	Big Heads and Trunnions: Tribocorrosion Turbocharged *Jesus M. Villa, MD, Arthritis Surgery Research Foundation, South Miami, FL*
1:33pm–1:39pm	A Next Generation Anatomically Contoured Ceramic Femoral Head *Andrew A. Freiberg, MD, Massachusetts General Hospital and Harvard Medical School, Boston, MA* **Presented by Kartik Mangudi Varadarajan, PhD*
1:39pm–1:45pm	Discussion
1:45pm–2:15pm	**Scientific Poster Session** *(Heritage Hall Foyer)* Note: Presenters will be available to answer questions.
2:15pm–4:15pm	**Multimedia Education Session** *(Tabor Room)*

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Presenters and Moderators

2014 Scientific Program Abstracts — Thursday McCoy's Peak Room Gerald Ford Hall

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

Thursday, July 17, 2014

General Session 1: Trauma

Moderator: Marc F. Swiontkowski, MD

6:50am–6:56am

Harley & Betty Baxter Resident Award

Semi-Elective Treatment of Open Tibial Shaft Fractures with Intramedullary Nail Fixation and Primary Wound Closure, Is It Safe?

Adam A. Sassoon, MD, MS
Ryan Durfee, MD
Joshua Langford, MD
Kenneth Koval, MD
George Haidukewych, MD

Introduction: Dogma driven treatment of open fractures with emergent operative debridement within a 6-hour time window has recently been challenged. It has been our policy to avoid overnight procedures to reduce resource utilization and preferentially operate with dedicated orthopedic surgical teams. Open fractures that are admitted during nighttime hours are typically brought to the operating room as a first case the following day in a semi-elective fashion. This delay in surgical treatment poses two questions: first and foremost, does a delay in treatment increase the incidence of deep infection; and second, is it safe to close these potentially colonized wounds primarily?

Methods: Following IRB approval, patients presenting to our level-one trauma center between 2009 and 2012 that underwent treatment for an open tibial shaft fractures (OTA 42) where surgery was intentionally delayed at least 6 hours following their injury were retrospectively reviewed. Treatment for all patients included irrigation and debridement, placement of an intramedullary nail, and primary wound closure. All patients received provisional wound irrigation and intravenous antibiotics in the emergency department. Tetanus vaccination status was also verified. Patients who required spanning fixation, fasciotomies, vacuum-assisted closure, or flap coverage were excluded from our analysis. Patients were followed until death, reoperation, or a minimum of 3 months. The mean clinical follow-up was 10 months (range 3-29 months). Patient age, gender, tobacco use, and medical comorbidities were noted. The mechanism of injury and Gustilo classification grade were determined. Time from injury until the first dose of antibiotics and operative treatment were also recorded.

Results: Between 2009-2012, 40 open tibia fractures occurring in 39 patients, with a mean age of 41 years, met our inclusion criteria and were treated using the aforementioned protocol. Twelve fractures were classified as Gustilo type 1 injuries, 15 as type 2, and 13 as type 3A. The average time from the injury until the first dose of antibiotics was 112 minutes (range: 36-458). The average time from the injury until operative treatment was 13 hours (range: 6-38). Following treatment, 4 deep infections occurred (10%). Of these, none occurred in Gustilo type 1 injuries, 1 occurred in Gustilo 2 injuries, and 3 in Gustilo 3A injuries. Thus, the infection rate for Gustilo type 1 injuries was 0%, the infection rate for Gustilo type 2 injuries was 8%, and the infection rate for Gustilo type 3A was 23%.

Discussion and Conclusion: This study challenges the dogma that open tibia fractures require urgent debridement within 6 hours and that primary closure after this window has elapsed is contraindicated. Treatment with a semi-elective protocol and immediate closure did not appear to increase the risk of infection when compared to historical controls treated on an emergent basis.

Notes:

6:56am – 7:02am

Epidemiology of Multiligamentous Knee Injuries and Associated Injuries: 10 Year Review at a Level 1 Trauma Center

Mark R. Elliott, MD
Corey Rosenbaum, DO
Anthony M. Harris, MD
Christopher H. Perkins, MD

Introduction: To characterize multiligamentous knee injury patterns and describe associated injuries.

Methods: Retrospective chart review of one hundred twenty four patients (129 knees) with multiligamentous knee injuries and/or dislocations from 2002-2012 presenting at a level 1 trauma center. Subgroup of 105 knees with appropriate magnetic resonance images available for ligamentous injury patterns.

Results: Vascular injuries occurred in 12% of the 129 knees. Peroneal nerve injuries also occurred in 12% of the knees with the most common ligamentous injury pattern being combined disruption of the anterior cruciate ligament, posterior cruciate ligament and posterolateral corner (33%). The average age of the patient was 36 years old and males sustained 77% of the injuries with motor vehicle crashes causing 39% of injuries. Forty seven percent of knees presented with gross dislocation and of those anterior dislocation was the most common. Open knee dislocation occurred in 5%. Twenty four percent of knees had associated ipsilateral tibial plateau fractures, 12% had associated ipsilateral femoral shaft fractures, and 15% had associated pelvic ring injuries. An intra-abdominal injury occurred in 18% of patients and a severe closed head injury in 21%.

Discussion and Conclusion: The incidence of arterial injury and peroneal nerve injury was lower than previous reported in the literature. Posterolateral corner injuries were highly associated with peroneal nerve injuries. One-fourth of knee dislocations were associated with ipsilateral tibial plateau fractures and just over half presented with a spontaneously reduced knee, which is comparable with the current literature. There is a high incidence of associated injuries, with ipsilateral femur and pelvic injuries being the most common. Due to the high rate of spontaneous reductions, polytrauma patients should be closely evaluated for multiligamentous knee injuries.

Notes:

7:02am–7:08am

The Value of a Saturday Dedicated Orthopaedic Trauma Operating Room

Robert P. Runner, MD
William M. Reisman, MD
Thomas Moore Jr., MD

Introduction: Hospital administrations constantly face cost-benefit decisions when balancing financial and patient care interests. Providing quality care in an efficient delivery model is imperative, especially at a large level 1 trauma center with recurring financial hardships. Clearing cases by operating more often can reduce patient length of stay (LOS) and overall costs. Beginning November 1, 2010, a new policy was implemented to have a dedicated Saturday orthopaedic trauma operating room to more efficiently work through a large caseload. The aim of this study is to assess the efficacy of this additional operative day by comparing the primary outcomes of LOS and surgical waiting time in patients admitted with femur or tibia fractures one year prior and one year after the implementation of the dedicated Saturday OR.

Methods: A retrospective chart review of the trauma registry for operative femur or tibia fractures from November 1, 2009 to October 31, 2011 initially identified 475 patients. 20 patients were excluded from analysis for misclassification of injuries. LOS was calculated from date of arrival and discharge. Waiting time to surgery was calculated from ED arrival to surgical incision time.

Results: After implementation of the Saturday OR, the overall LOS for trauma patients with femur or tibia fractures was significantly reduced by 2.7 days. Additionally, there was an average reduction of 25.1 hours in waiting time to surgery for patients admitted on a Friday. Furthermore, there was a 59% increase in the number of cases performed on Saturdays, while the originally disproportionally high number of operations on Mondays was appropriately reduced by 33%.

Discussion and Conclusion: Overall, the findings of reduced LOS and re-distribution of case load support the continuation of a dedicated Saturday orthopaedic trauma OR and can save the hospital system over $750,000 per year through increased efficiency.

Notes:

7:08am–7:14am

Degree of Joint Depression Predicts Meniscal Tear in Lateral Tibial Plateau Fractures

Cary Schwartzbach, MD
Bryan J. Whitfield, MD
Amber W. Trickey, PhD, MS, CPH

Introduction: This study was designed to evaluate the correlation between the presence of meniscal tears and fracture characteristics in lateral plateau fractures.

Methods: This IRB-approved study retrospectively reviewed all tibial plateau fractures operated on in our institution between 1 Aug 2005 and 30 Sept 2010. All records were reviewed for patient age and gender, Schatzker type, amount of joint depression and coronal gapping as seen on CT as well as presence of a meniscal tear. 138 patients with complete data were identified.

Results: The strongest predictors of meniscal tear were internal depression and gap. Each additional millimeter of internal depression increased the odds of meniscal tear by 18% (OR: 1.18, 95% CI: 1.11, 1.26). Each additional millimeter of gap increased the odds of meniscal tear by 9% (OR: 1.09, 95% CI: 1.05, 1.14). Schatzker fracture type was also related to the likelihood of meniscal tear, with type V injuries more than twice as likely to sustain a tear compared to all other Schatzker types (OR: 2.29, 95% CI: 0.93, 5.67), although this association did not reach statistical significance at the 0.05 level. Multivariate analysis confirmed only depression as a predictor of meniscal tear (OR: 1.16, 95% CI:1.07, 1.26). Finally, the probability of a meniscus tear was greater than 50% when the internal depression was 9 mm for Schatzker type V and 13 mm (all Schatzker types). Age and gender were not predictive of meniscal tears.

Discussion and Conclusion: Surgeons should be aware of these data when deciding to perform an arthrotomy in the treatment of these fractures as outcome is often determined by the status of the meniscus and the present study has shown a correlation between fracture characteristics and the presence of a tear.

Notes:

7:14am–7:20am

Small Fragment Fixation of Bicondylar Tibial Plateau Fractures

Adam A. Sassoon, MD, MS
Jeffrey Petrie, MD
Thomas Lucak, BS
Ryan Mizell, BS
Kenneth Koval, MD
George Haidukewych, MD
Joshua Langford, MD

Introduction: Large fragment fixation has traditionally been used to treat bicondylar tibial plateau fractures. This study seeks to determine the ability of small fragment fixation to achieve maintenance of reduction and ultimately union in these complex fractures.

Methods: A retrospective review of our institution's trauma database was performed to identify bicondylar tibial plateau fractures that occurred in skeletally mature individuals and were treated with small fragment fixation (screw size 3.5mm or less). Patients were followed until death, fracture union, or a minimum of 1 year. Age, gender, BMI, fracture mechanism, soft tissue status, the use of preliminary external fixation, and OTA fracture classification were noted. Treatment variables including the number of plates, total number screws, number of rafting screws, the use of a "kickstand" screw, bone grafting, medial proximal tibial angle (MPTA), and distance from the proximal-most screw to the articular surface were recorded. Outcomes including union, the need for a secondary surgery, and complications were assessed. The maintenance of reduction was judged on plain radiographs by calculating changes in the MPTA and distance between indwelling hardware and the articular surface.

Results: Fifty-three bicondylar tibial plateau fractures treated with small fragment fixation were identified and followed for an average of 12.5 months in 34 males and 19 females with a mean age of 53. An average of 1.6 plates, 12.8 total screws, 4.2 rafting screws, and 1.5 kickstand screws were used in the fixation constructs. Following fixation, the mean MPTA was 89° (83°-99°), and the mean distance from the articular surface to the proximal-most screw was 7mm (1-15mm). Forty-eight fractures united during follow-up (91%). There were only 2 mechanical failures (4%). There were 6 infections (11%), and 18 secondary surgeries required (18%). Four patients required conversion to total knee arthroplasty. The

mean change in MPTA was 0.6° of varus (10° varus to 6° valgus) and was only greater than 5° of varus or valgus in 3 patients. An average of 0.7 mm of articular surface depression was observed (13mm of depression to 3 mm of elevation), and only greater than 5mm in one patient.

Discussion and Conclusion: Small fragment fixation constructs can be successfully used to treat bicondylar tibial plateau fractures with an observed union rate of 91% and mechanical failure rate of 4%. Mean interval changes in reduction were minimal, with respect to the MPTA and articular surface height. Alignment changes of 5° or 5mm of joint depression were only observed in 0.6% and 1.8% of fractures, respectively.

Notes:

7:20am–7:26am

A Biomechanical Comparison of Calcium Phosphate and Fibular Allograft for Metaphyseal Bone Defect Management in Split Depression Tibial Plateau Fractures

Stuart M. Saunders, MD
John M. Yanik, BS
Philip J. Brown, MS
Anna N. Miller, MD
Jason J. Halvorson, MD
Joel D. Stitzel Jr., PhD
Eben A. Carroll, MD
Maxwell K. Langfitt, MD

Introduction: The treatment of split depression tibial plateau fractures involves elevation of the depressed articular fragment with bone grafting of the resultant metaphyseal bone defect. Biomechanical studies have touted calcium phosphate cement as superior to autogenous cancellous bone graft. However its use is associated with higher costs. Clinical series have demonstrated allograft fibula yields outcomes similar to other bone grafting options. The purpose of this study was to evaluate fibular allograft as an alternative to calcium phosphate for metaphyseal bone defect management in split depression tibial plateau fractures in a biomechanical model.

Methods: 6 matched pairs of fresh frozen cadaveric tibiae were systematically fractured to create a split depression fracture of the lateral plateau. During repair each tibia of a matched pair was randomly assigned to either calcium phosphate or fibular allograft for the metaphyseal bone defect. All specimens were repaired with a periarticular plate. The tibiae were then mechanically evaluated using a hydraulic test frame under force-controlled cyclic fatigue loading to imitate rehabilitative walking. All specimens were loaded to failure.

Results: When individual fatigue cycle intervals were analyzed there was no significant difference in the stiffness or displacement of the articular surface of tibiae repaired with fibular allograft versus calcium phosphate over equivalent loading cycles. When analyzing the fatigue data as a whole calcium phosphate cement had a 120.55 N increase in stiffness over fibular allograft and displayed 0.12 mm less displacement. There were no significant differences between the two during failure testing.

Conclusions: Fibular allograft produced an articular reconstruction of similar stiffness to that of calcium phosphate. From a clinical standpoint, the magnitude of articular subsidence in the two groups was equal. Given the lower cost associated with fibular allograft, it may be a viable alternative for management of metaphyseal bone defects in split depression tibial plateau fractures.

Notes:

7:26am–7:32am

Risk Factors for Infection in Tibia Plateaus with Compartment Syndrome

Jason A. Lowe, MD
*Brian E. Etier Jr., MD

Introduction: Infection is a known complication following surgical fixation of tibia plateau fractures with compartment syndrome. Factors leading to subsequent infection are not

well defined. This study evaluated injury, patient, and treatment factors that contribute to infection. The hypotheses are: patient factors (diabetes, tobacco use, BMI), increasing fracture severity (Shaztker IV, V, and VI), and operative fixation through fasciotomy incisions positively correlate with post-operative infection.

Methods: Review of 925 tibia plateau fractures over a 12 year period revealed 42 tibia plateau fractures with concomitant compartment syndrome (4.5%). Patient factors, fracture patterns, and surgical treatment were reviewed. Superficial infection was defined as the use of antibiotics and local wound care. Deep infection was defined as culture positive infection requiring surgical irrigation and debridement. Discrete predictors for infection were examined using Fisher's Exact Test; continuous predictors (age and BMI) were examined using t-tests. All other continuous variables were analyzed with the Mann Whitney U. A p less than 0.05 was statistically significant.

Results: Overall incidence of superficial and deep infections was 38% and 21% respectively. When incorporating the fasciotomy and operative incision, 10/12 (83%) patients developed a superficial or deep infection. Infection developed in 6/21 (21%) patients with fixation through a separate incision (p=0.003). Diabetes tended toward deep infection (57% with diabetes versus 15% without diabetes; p=0.080). Low Schatzker scores (I, II, or III) tended toward superficial infection when compared to high Schatzker scores (IV, V, or VI) (80% versus 32%, p=0.06). Low Schatzker scores also tended toward deep infections when compared to high Schatzker scores (60% versus 16%, p=0.057).

Conclusion: Fasciotomy incision into an exposure for operative fixation is the only treatment factor that statistically increases the risk of post-operative infection. Separate surgical incisions should be utilized. Diabetic patients and low Schatzker fracture patterns tended toward an increase in post-operative infections.

Notes:

Thursday, July 17, 2014

General Session 2: Pediatrics

Moderator: Gregory A. Mencio, MD

7:40am–7:46am

SOA Resident Travel Grant Award

Immobilization Versus Observation in Children with Toddler's Fractures: A Retrospective Review

Lauren C. Leffler, MD
Michael L. Beckish, MD
Stephanie L. Tanner, MS

Introduction: Toddler's fractures are a common injury among young children. The published literature recommends treatment in long-leg casts, though current practice of many orthopedists is treatment with a short-leg cast. However, with the thickened periosteum children have, one questions whether immobilization is necessary at all. The purpose of this study is to review the results of children with toddler's fractures treated with long-leg casts, short-leg casts, or without immobilization.

Methods: A retrospective review was conducted of all tibia fractures in children treated by two pediatric orthopedic surgeons from January 2007 to December 2012. Children under six years old with a non-displaced displaced spiral or oblique tibial shaft fracture were included in the study. Records and radiographs were analyzed for time to return to ambulation, radiographic healing, number and type of casting complications, and pain control.

Results: 136 patients were identified, 85 of which were included in the final analysis. 19 were treated in long-leg casts (LLC), 59 in short-leg casts (SLC), and 7 with no immobilization (NI). Average time to return to ambulation was 15.6 days across all groups, 9.9 days for NI group, 15.3 days for SLC group, and 19.1 days for LLC group. There were 11 total casting complications, all minor in severity and treated conservatively. There were no complications in the non-immobilized group. One patient in the short-leg cast group displaced his fracture, but was successfully treated with continuation of short-leg casting.

Discussion and Conclusions: This is the largest series of toddler's fractures to date. The results suggest that toddler's fractures may be effectively treated with short-leg casts or without immobilization. Further prospective study is necessary to confirm this conclusion.

Notes:

7:46am–7:52am

Radius and Ulna Shortening Osteotomies with a Green Transfer for Pediatric Wrist Flexion Contracture

Donald C. Faust, MD
Katherine C. Faust, MD
Mae Young, MD
Joseph A. Gonzales Jr., MD

Introduction: Pediatric patients who develop wrist flexion contractures can develop pain, skin complications, and poor hand use. Nonoperative management includes stretching, bracing, casting, and anti-spasmodic medications. However, these modalities may fail to respond to these modalities, recur after some improvement, or worsen with time and growth. Musculotendinous resections, tendon lengthening, proximal row carpectomy, and wrist arthrodesis are surgical options for wrist flexion contracture. We present a method used by two attending physicians at a tertiary pediatric hospital who have had good results from radius and ulna shortening osteotomies with transfer of the FCU tendon to the ERCB.

Methods: A technical guide using representative cases from the two senior surgeons will be presented.

Results: The 9 patients presented with the following etiologies of spastic wrist contracture: cerebral palsy, cerebrovascular accident, and Volkamann's contracture. They have been followed for at least 1 year. Average motion preoperatively showed wrist motion of 60-90 degrees of flexion; placing the wrist in maximum passive extension resulted in inability to extend the fingers. In all patients, postoperative range of motion showed extension of the fingers with the wrist at neutral and ability to extend the wrist at least 40 degrees.

Discussion and Conclusion: Surgical options for contracture must be considered once conservative measures fail. Procedures described for patients with little hand use in order to allow for better hygiene include elbow resection for elbow contracture; proximal row carpectomy with fusion, FDS resection, and FDP lengthening for wrist contracture; and FDS release for finger contractures. Tendon lengthening results in scar tissue and weakening. Proximal row carpectomy to decrease the working length of tendons has unpredictable and limited correction. In pediatric patients with wrist flexion contractures, we have found radius and ulna shortening followed by the Green transfer is a successful procedure to improve hand function.

Notes:

7:52am–7:58am

Circular External Fixation for Correction of Deformity in Blount Disease

Stephanie W. Mayer, MD
Daniel Sun, BS
Robert K. Lark, MD, MS
Robert D. Fitch, MD

Introduction: Blount disease causes a three dimensional deformity of the proximal tibia and many methods of correction are described. The purpose of this study is to evaluate the results of correction of Blount disease in young patients using circular external fixators.

Methods: 53 patients met inclusion criteria. The medial proximal tibial angle (MPTA), mean axis deviation (MAD), posterior proximal tibial angle (PPTA), and knee joint angle (KJA) were measured on radiographs pre-operatively, pre-frame removal, and at last follow up. A t-test was used for statistical analysis to determine radiographic changes from baseline as well as any recurrence between frame removal and last follow up. The population was further analyzed for differences between those who had an Ilizarov or TSF, those who had a diagnosis of infantile or late onset disease, and those who had or had not undergone previous surgery.

Results: The average age was 11.15 years old. Mean follow up time was 29.88 months. Mean pre-operative MPTA (71°), MAD (3.41), and KJA (5°) were significantly improved at the time of frame removal (MPTA (87°), MAD (0.46), KJA (3°)) as well as at the last follow up visit (MPTA (86°), MAD (0.33), PPTA (72°), and KJA (2°)). There was no significant difference between the pre-frame removal measurements and those at the last follow up. There was no difference in any measurement or degree of improvement between the Ilizarov or TSF groups except for the KJA which was significantly improved in the TSF group (2° vs 5°). There was no significant difference in measurements between those who had prior surgery or not or between patients with infantile or late onset disease.

Discussion and Conclusion: The MPTA, MAD and KJA were significantly improved using circular external fixators. This improvement was durable following frame removal. Frame type, prior surgery and diagnosis did not affect the outcome.

Notes:

7:58am–8:04am

Intermediate Results of the Bernese Periacetabular Osteotomy for the Treatment of Perthes-Like Hip Deformities

Stephen T. Duncan, MD
Angela Keith
Geneva Baca
Perry L. Schoenecker, MD
John C. Clohisy, MD

Introduction: Perthes-like hip deformities are complex and variably encompass characteristic femoral deformities and secondary acetabular dysplasia. The need for acetabular correction in these hips is controversial and the intermediate results of these procedures are extremely limited. The purpose of this study was to analyze the intermediate clinical and radiographic results obtained with periacetabular osteotomy (PAO) for the treatment of acetabular dysplasia in these complex hips.

Methods: Retrospective review for patients who underwent PAO for symptomatic Perthes-like deformity was performed. 34 hips (31 patients) with average age of 22 years (range, 12-44) were treated with periacetabular osteotomy from March 1997 through April 2008 with 8 patients having bilateral PAOs performed, 15 having an concomitant proximal femoral osteotomy, 5 having a surgical dislocation to allow access to treat intra-articular pathology, and 4 having relative femoral neck lengthening. The average follow-up was 5 years. Clinical data including patient demographics, radiographic measurements, and patient-rated outcome scores were collected.

Results: Average improvements of 26.5° in the lateral center-edge angle, 32.9° in the anterior center-edge angle, and 20.8° in the Tönnis angle. The hip center was translated medially an average of 6.1 mm and the extrusion index improved an average of 25.4. The Harris Hip score improved 16.6 points (from 59.1 to 75.7). At the time of the most recent follow-up, four (11.8%) of the hips had required conversion to total hip arthroplasty.

Conclusion: The treatment for residual Perthes deformities in patients with acetabular dysplasia requires careful surgical planning. PAO is an effective technique for surgical correction of the dysplastic acetabulum in patients with Perthes-like hip deformities with good intermediate clinical results and an acceptable conversion rate to total hip arthroplasty. PAO should be considered in the surgical treatment of patients with Perthes-like hip deformities associated with acetabular dysplasia and clinical/intraoperative signs of hip instability.

Notes:

8:04am–8:10am

Early Complications in the First Year Following Posterior Spinal Fusion for Adolescent Idiopathic Scoliosis

F. Patterson Owings, MD
Nicholas D. Fletcher, MD

Purpose: Few studies have reported on the early complications related to posterior spinal fusion for correction of adolescent idiopathic scoliosis (AIS). The purpose of this study was to determine the types of complications, their prevalence and the rate of readmission and/or reoperation within the 1st year following posterior spinal fusion for AIS and to identify factors that influence their prevalence.

Methods: All patients who underwent posterior spinal fusion for AIS during the period January 2006-December 2008 at 2 hospital campuses within the same hospital system were included. Patient charts were retrospectively reviewed for demographic data and to determine length of surgery, number of fusion levels, ASA score, estimated blood loss, length of hospital stay, and any subsequent complications that developed within 1 year of surgery.

Results: Of a cohort of 364 patients undergoing posterior spinal fusion for AIS, there were 52 complications for an overall prevalence of 14.0%. There were 37 surgical site/wound complications (10.16%), 12 medical complications (3.3%), and 2 hardware related complications (0.6%). Eleven patients required reoperation (8 with surgical site infections, 2 with hardware failure and 1 with retained surgical equipment). In addition to 10 patients readmitted for reoperation, 5 others were readmitted: 3 for IV antibiotics and 2 for medically unrelated reasons. The only parameter that correlated with a higher prevalence of complications was the number of levels fused. Age at time of surgery, length of hospital stay, length of surgery, ASA class, and estimated blood loss did not correlate with increased risk of early postoperative complications.

Conclusions: The prevalence of early postoperative complications following posterior spinal fusion for AIS in this study was 14%. Of our patients 4.12% required readmission and 3.0% required reoperation. The only factor associated with an increased risk of complications within the 1st postoperative year was the number of levels fused.

Notes:

8:10am–8:16am

Clinical Impact of Adopting a Novel Post-Operative Pathway on Hospital Stay Following Posterior Spinal Fusion for Adolescent Idiopathic Scoliosis

David E. Lazarus, MD
Benjamin J. Geddes, BS
Robert J. Owen, BS
Phillip M. Mitchell, MD
Michael L. Schmitz, MD
Dennis P. Devito, MD
Nicholas D. Fletcher, MD

Introduction: Prior reports of accelerated discharge (AD) following posterior spinal fusion (PSF) for adolescent idiopathic scoliosis (AIS) focused on patients treated by different surgeons in separate hospital systems. The purpose of this study is to evaluate the impact of adopting a novel pathway on discharge following PSF for AIS using a single group of surgeons.

Methods: A retrospective review of patients undergoing PSF for AIS was performed evaluating demographics, curve characteristics, surgical intervention and complications. Patients were divided based on their surgery occurring before or after the adoption of an AD pathway. Patients in the AD pathway were treated with early transition to oral pain medications, regular mobilization postoperative day one, rapid reinstitution of a regular diet, and discharge prior to return of bowel function. Patients treated prior to the AD pathway were managed using a traditional (TD) pathway.

Results: Four surgeons performed 75 PSF for AIS using the TD pathway and 84 PSF after adoption of the AD pathway. There was no difference in age, sex, and preoperative thoracic or thoracolumbar curve magnitudes between groups. There was no difference in groups with regards to the use of osteotomies, number of levels fused or number of screws. Patients managed in the AD cohort had 1.2 hour shorter surgical times. Length of stay was 0.98 days or 24.3% less in patients in the AD pathway (3.05 days (95%CI 2.99-3.16) vs. 4.03 days (95%CI 3.04-4.20). There was no difference in wound complications requiring surgical intervention (4.0% TD vs. 6.0% AD).

Discussion and Conclusion: The use of a coordinated discharge pathway helped to reduce length of stay in patients undergoing PSF for AIS without increase in complications.

This study demonstrates the utility and safety of rapid mobilization and discharge prior to return of bowel function for patients undergoing PSF.

Notes:

8:16am–8:22am

Children with Medicaid Requiring Spinal Fusion for Scoliosis Present with Larger Curves than Patients with Private Insurance

David E. Lazarus, MD
Mihir J. Desai, MD
Robert W. Bruce, MD
Nicholas D. Fletcher, MD

Introduction: Children with Medicaid may have difficulty accessing care for adolescent idiopathic scoliosis (AIS). The first purpose is to determine whether patients with Medicaid present with larger curve magnitude and wait longer for surgery. The second purpose is to determine the impact of adding a junior partner on improving access to care for underinsured patients.

Methods: Patients treated with spinal fusion (SF) for AIS between 2008-2012 were reviewed, with second opinions excluded. Patients were divided whether their surgery was performed before or after the addition of a junior partner. The time from evaluation to the determination for surgery, the time from recommendation for surgery until the actual procedure, and insurance status were all evaluated. Radiographs were reviewed to determine the Cobb angle at initial presentation.

Results: The senior author performed 65 spinal fusions for newly diagnosed AIS from 2008 until 2010, 39% of whom had Medicaid insurance. There was a significantly larger initial Cobb angle (57.2±15.7° vs. 47.5±14.3°), time from the decision for surgery until intervention (168±181 days vs. 102±40 days), and time from the patient scheduling surgery until the procedure (115±37 days vs. 97±3 days) in the Medicaid group. Upon bringing on a junior partner, we performed 70 spinal fusions for newly diagnosed AIS from August 2011 until December 2012, 36% of whom had Medicaid insurance. Patients with Medicaid treated after addition of a junior partner had 13.9% smaller Cobb angles, 48% faster time to spinal fusion from the time of initial surgical recommendation, and 28.7% faster time from scheduling until surgery than Medicaid patients in the first group.

Discussion and Conclusion: Patients with Medicaid who underwent SF for AIS had larger presenting Cobb angles and longer delays until surgery than those with private insurance. This discrepancy improved with the addition of a junior partner.

Notes:

Thursday, July 17, 2014

Concurrent Session 4A: Arthroplasty I — Outcomes and Complications *(McCoy's Peak Room)*

Moderator: David W. Romness, MD

12:30pm–12:36pm

Medicaid Patients Have Inherently Higher In-Hospital Complication Rates and Costs After Primary Total Joint Arthroplasty

James A. Browne, MD
Michele R. D'Apuzzo, MD
Wendy M. Novicoff, PhD

Introduction: Previous reports suggest that significant disparities exist in outcomes following total joint arthroplasty (TJA) amongst patients with different payer status. The explanation for these differences is largely unknown and may result from confounding variables. The Affordable Care Act expansion of

Medicaid coverage in the year 2014 makes the examination of these disparities particularly relevant.

Methods: The Healthcare Cost and Utilization Project (HCUP) Nationwide Inpatient Sample (NIS) database was used to identify patients undergoing primary hip (THA) and knee (TKR) arthroplasty from 2002 to Dec. 2011. Complications, costs, and length of stay for these patients with Medicaid payor status were compared to non-Medicaid patients. To control for potential confounders and comorbid conditions, each Medicaid patient was matched to a non-Medicaid patient using age, gender, race, procedure type (total hip or total knee arthroplasty), procedure year, hospital characteristics, smoking status, and all 29 comorbid-defined elements in the NIS-modified Elixhauser comorbidity measure.

Results: 191,911 patients undergoing TJA were found to have Medicaid payer status (2.8% of the entire TJA population). Of this cohort, 107,109 patients (56% of the entire Medicaid cohort) were able to be matched one-to-one to a non-Medicaid patient for all variables for the adjusted analysis. After matching, Medicaid patients had a higher incidence of postoperative in-hospital infection, hematoma, wound dehiscence, and periprosthetic fracture, but a lower risk of cardiac complications (all p values less than 0.01). Length of stay was almost half a day longer, total cost was higher, and discharge to an inpatient facility was more frequent for patients with Medicaid status.

Conclusion: Medicaid patients have a significantly higher risk for select postoperative in-hospital complications and consume more resources following TJA even when extensively matching for patient-related factors and comorbid conditions commonly associated with low socioeconomic status. These novel findings have important implications given the imminent expansion of Medicaid coverage for low-income adults. Further work is needed to understand the complex interplay between socioeconomic status and outcomes, ensure appropriate resources are allocated to maintain access for this patient population, and develop appropriate risk stratification.

Notes:

12:36pm–12:42pm

Harley & Betty Baxter Resident Award

Diabetes, HgbA1c, and Complications in Revision Hip and Knee Arthroplasty

Mathew J. Mazoch, MD
Kasa B. Cooper, BS
Marty K. Bushmiaer, APRN
C. Lowry Barnes, MD

Introduction: The risks of complications in diabetics undergoing primary total joint arthroplasty are well discussed in the literature; however, little is written about diabetics' risks with revision procedures. This study evaluates complications surrounding revision arthroplasty in diabetics compared to controls.

Methods: IRB approval was obtained on 635 patients undergoing revision total hip and knee surgery since 2004, prior to the authors' arrival at the institution in 2012. Sixty-five diabetics that underwent revision arthroplasty were compared to 65 matched controls. Demographics, co-morbidities and HgbA1c levels were analyzed in comparison to complications encountered.

Results: Ten percent (10.2%; 65/635) of patients had both diabetes and HgbA1c levels drawn. Thirty (46%) diabetics experienced 58 complications and underwent 25 additional procedures. Complications included infections (12), extensor mechanism issues (12), arthrofibrosis requiring manipulation (10), peri-prosthetic fractures (6), delayed wound healing (5), implant failure or subsidence (4), girdlestone (3), amputations (2), one each of heterotopic ossification, uncontrolled pain, death from sepsis, and foot drop. Twenty-three (35%) controls experienced 35 complications and underwent 22 additional procedures. Complications included infections (3), extensor mechanism issues (6), arthrofibrosis requiring manipulation (5), wound issues (3), implant failures (5), and dislocations requiring revision (3). Diabetics experiencing complications had an average HgbA1c of 6.8 compared to 6.0 without complications. Diabetics had an 11% higher complication rate (46% vs 35%) and number of complications (58) than controls (25). Diabetics had a higher risk of developing infections (18.4% vs 4.6%), extensor mechanism complications (18.4%vs9.2 %), arthrofibrosis requiring manipulation (15.3% vs 7.7%), delayed wound healing (7.6% vs 4.6%), and periprosthetic fractures (9.2% v s0%). Non-diabetics experienced

more hip dislocations (3) than diabetics (0). Diabetics experienced more severe rare complications such as girdlestone (3 vs 0), amputation (2 vs 0), foot drop (1 vs 0) and death (1 vs 0) compared to controls.

Discussion and Conclusion: The study suggests that diabetics with better glycemic control tend to have fewer complications. Diabetics undergoing revision arthroplasty appear to be at a higher risk of developing infections, extensor mechanism complications, arthrofibrosis, peri-prosthetic fractures, and rare events than non-diabetics.

Notes:

12:42pm–12:48pm

SOA Presidents' Resident Award

Body Mass Distribution as a Significant Risk Factor for Complications After Total Hip Arthroplasty

Travis Wilson, MD
Matthew Jordan, MD
Daniel Jupiter, PhD
Bryce C. Allen, MD
Christopher Chaput, MD

Introduction: Obesity may be a risk factor for post-operative complications, although there is some controversy surrounding this issue. There has been a paucity of literature examining the relationship between body mass distribution and complications after THA.

Methods: A retrospective review was performed on 1477 patients from 2003 – 2011. Risk factors such as age, gender, diabetes mellitus and BMI (body mass index) were identified and lateral soft tissue thickness (LSTT), measured from the greater trochanter to the skin surface on AP hip radiographs. Bivariate and logistic regression analysis was used to determine the relationship between LSTT and surgical complications, medical complications, overall complications, and revisions.

Results: 276 (18.69%) had postoperative complications. Age was significantly associated with combined medical/surgical complications and medical complications alone. Female gender was associated with medical complications. Presence of diabetes was associated with the need for revision surgery. BMI was not associated with complications or revisions. LSTT was a significant risk factor for combined medical/surgical complications, surgical complications, and need for revision.

Discussion and Conclusion: Body mass distribution at the surgical site is more associated with postoperative complications than BMI in patients undergoing THA.

Notes:

12:48pm–12:54pm

Is Screening for Periprosthetic Joint Infections Using ESR and CRP per AAOS Clinical Guidelines Cost Effective?

Eric M. Greber, MD
Marty K. Bushmiaer, APRN
C. Lowry Barnes, MD

Introduction: Until recently, there has been no consensus of the best approach to differentiating aseptic from septic loosening in joint replacement patients. The recent AAOS Clinical Practice Guideline Summary, published in 2010, strongly recommends that orthopedic surgeons obtain ESR and CRP for all patients needing hip and knee arthroplasty revision surgery. The AAOS guidelines also suggest that the joint be aspirated based upon these results. The purpose of this study was to determine \ whether these guidelines have been helpful and cost effective in determining periprosthetic joint infections.

Methods: Charts from 50 consecutive patients who underwent revision total hip or knee arthroplasty were retrospectively reviewed. Each patient received an ESR and CRP level

prior to revision surgery and patients with known periprosthetic joint infections were excluded from the study. As guidelines recommend, aspiration with cultures and cell count were obtained on all knees with either elevated ESR or CRP and all hips with elevated levels for both ESR and CRP. The number of revision hip or knee arthroplasty patients who benefited from finding a subclinical periprosthetic infection and changing the intraoperative treatment based on the results of ESR, CRP, and aspiration was calculated. Hospital charge data was collected in order to report the cost of this additional testing during surgery.

Results: Sixty-four percent (32/50) patients had elevated ESR and/or CRP. Eighteen patients (12 hips; 7 knees) required joint aspirations per the AAOS guidelines. None of the aspirations were positive for bacterial growth. The total hospital charges for aspiration and cultures in this patient population were $81,712.44, while no sub-clinical infections were identified.

Conclusion: Although guidelines may more readily diagnose every case of sub-clinical joint infection, we must continue to evaluate the whether the addition of this testing is cost effective and beneficial for the patients.

Notes:

12:54pm–1:00pm

Routine Intraoperative Cultures in Revision Joint Arthroplasty Surgery with Low Clinical Suspicion for Infection

Paul K. Edwards, MD
Eric M. Greber, MD
Marty K. Bushmiaer, APRN
Becky Wilson, BS
Cara Petrus, MHA
C. Lowry Barnes, MD

Introduction: Periprosthetic joint infections (PJI) continue to be a diagnostic challenge for orthopedic surgeons. Chronic PJI are sometimes difficult to diagnose and occasionally present in a subclinical fashion with normal CRP/ESR and/or normal joint aspiration. Some institutions advocate for routine use of intraoperative culture swabs at the time of revision surgeries to definitively rule out infection. The purpose of this study was to determine whether routine intraoperative cultures is an appropriate and cost effective method of diagnosing subclinical chronic PJI in revision joint replacement patients with a low clinical suspicion for infection.

Methods: A retrospective chart review of 33 patients who underwent revision hip or knee replacement from a single surgeon over a five-month period was completed. The AAOS guidelines for preoperative PJI workup were followed. 13 patients were diagnosed preoperatively with infection and excluded from the study. 20 patients underwent revision joint replacement and three separate cultures swabs were taken for each patient to help in determining true-positive cultures. Infectious Disease was consulted for all patients with any positive culture. At our hospital, the cost billed to insurance for a single culture is $1,458.58. We did not calculate the cost of the consultant fee.

Results: Three (15%) of the 20 revision arthroplasty patients had a single positive culture. Infectious Disease consultants diagnosed all three of these positive cultures as contaminants. None of the patients had a true-positive intraoperative culture. The total cost billed by the hospital to obtain these cultures in all 20 patients was $87,514.80

Discussion: The results of this study indicate that obtaining a set of three intraoperative cultures for those patients with a negative preoperative infection workup was both cost prohibitive and did not result in a single le subclinical infection. Studies to find reliable, accurate, and cost effective alternatives to diagnose PJI are warranted.

Notes:

1:00pm–1:06pm

Wound Complications with Therapeutic Anticoagulation After Total Joint Arthroplasty

Ryan M. Nunley, MD
James A. Keeney, MD
John C. Clohisy, MD
Staci R. Johnson, MEd
Douglas J. McDonald, MD
Robert L. Barrack, MD

Introduction: Venous thromboembolic events (VTE) are the most common complication following total joint replacement. This study prospectively compared mobile compression devices (MCDs) and warfarin regarding safety and efficacy for preventing VTE post-operatively and monitored related complications.

Methods: Patients undergoing elective primary or revision knee or hip arthroplasty were enrolled in this prospective study. Patients were stratified to standard or high risk anticoagulation according to local clinical protocol. Standard risk patients wore MCDs 10 days and took aspirin six weeks post-operatively. High risk patients received adjusted-dose warfarin 4 weeks and compression stockings 6 weeks post-operatively. Patients were followed prospectively for 6 months and monitored for complications, symptomatic VTEs, and hospital readmissions. Changes in local clinical protocols affecting anticoagulation included changes in risk stratification and introduction of tranexamic acid (TXA) during surgery. Participants enrolled prior to changes in risk stratification were considered Phase 1; those after were considered Phase 2. Participants enrolled prior to institution of TXA were considered pre-TXA and after post-TXA.

Results: 2,053 participants were eligible for 6 week follow-up. Of those, 1,336 were standard risk and 717 were high risk. The rate of VTE (DVT/PE) at 6 weeks was 0.4% in both risk groups. No differences were found in procedure (knee vs. hip, primary vs. revision), phase, or TXA status. Rate of major bleeding was significantly higher in high risk patients (2.4%) than standard risk (0.6%). Again, no differences were found in procedure, phase, or TXA status.

Conclusion: Using MCDs for preventing VTE was equivalent to warfarin, even after changes in risk stratification and introduction of TXA. Use of MCDs resulted in a statistically significant decrease in major bleeding events compared to warfarin, which is important for patient satisfaction and reducing hospital readmissions.

Notes:

1:06pm–1:12pm

Effect of Tranexamic Acid on Blood Utilization and Thromboembolic Events After Hip and Knee Surgery

Ryan M. Nunley, MD
Scott M. Wingerter, MD
Ronald R. Jackups Jr., MD, PhD
Staci R. Johnson, MEd
Robert L. Barrack, MD

Introduction: The effectiveness of tranexamic acid (TXA) in reducing blood loss and minimizing transfusions has been documented in many surgical subspecialties. The purpose of this study is to determine any changes in transfusion rates or incidence of venous thromboembolic events (VTE) following the institution of routine use of TXA in hip and knee arthroplasty.

Methods: A retrospective review of a prospectively collected database was performed to include all patients undergoing primary or revision joint replacement or resurfacing over 2 years with patients prior to and after the institution of the routine use of TXA. All patients were stratified into low, intermediate, and high-risk groups for TXA dosing. A concurrent prospective study on our local anticoagulation protocol collected incidence of VTE.

Results: Transfusion rates decreased significantly for hip and knee surgeries. In 1,320 hip cases, 29.52% of patients receiving no TXA vs. 10.73% patients receiving TXA were transfused at least one non-autologous unit. Transfusion rates dropped in primary THA (28.25% to 7.22%), revision THA (48.51% to 37.70%), and hip resurfacing (5.56% to 0%). In 886 knee cases, 18.85% of patients receiving no TXA vs. 3.64% of patients receiving TXA were transfused. Transfusion rates dropped in primary TKA (17.10% to 3.07%) and revision TKA (30.00% to 7.41%). Most importantly, from our

prospective data collected on VTE, there was no significant difference in the incidence of thromboembolic events with TXA compared to no TXA at 4-6 weeks (2/690=0.3% vs. 6/1067=0.6%) or at 6 months (2/482=0.4% vs. 8/1181=0.7%) postoperatively.

Conclusion: Tranexamic acid aids in a decreased transfusion rate following primary and revision hip and knee arthroplasty and, for the first time, we have prospective data on VTE to show no increase in events with the addition of TXA.

Notes:

1:12pm–1:18pm

Differences Between Observed and Patient-Reported Functional Status Following Primary Total Joint Arthroplasty

A. Jordan Grier, BS, MS-IV
Robert J. Butler, DPT, PhD
Samuel S. Wellman, MD
David E. Attarian, MD, FACS
Michael P. Bolognesi, MD
Robin M. Queen, PhD

Introduction: Functional assessments after total joint arthroplasty (TJA) typically consist of subjective self-reported metrics, such as the WOMAC, or complex laboratory-based gait assessments. The Lower-Quarter Y-Balance Test (YBT-LQ) is a low-cost and convenient assessment of dynamic balance that requires strength, flexibility, and proprioception. Use of functional testing following TJA adds an objective, unbiased measure of postoperative functional status to the current testing protocol. Our objective was to examine the correlation between YBT-LQ scores and the WOMAC function subscale scores (WOMAC-F) in TJA patients.

Methods: Fifty-one patients undergoing primary, unilateral TJA (27 TKA, 24 THA) were tested with the YBT-LQ between 6 and 25 months postoperatively. Before undergoing YBT-LQ testing, all patients had to be able to maintain unilateral stance on each leg for 10 seconds. The YBT-LQ assesses dynamic balance in the anterior, posteriomedial and posterolateral reach directions with the reach distance normalized to leg length. A WOMAC questionnaire was obtained at the same point in time. Pearson's correlation coefficients were used to examine the relationships between WOMAC-F and the YBT-LQ composite scores as well as normalized operative and non-operative leg reach distances in all directions.

Results: The THA (54.5± 13.5yrs; BMI 29.7± 7.00) and TKA (60.4± 7.99yrs; BMI 30.3± 5.44) groups had mean postoperative times of 13.7± 4.79 and 12.8± 3.67 months, respectively. Operative and non-operative leg (r=-.435, r=-.388, respectively) YBT-LQ composite scores were moderately correlated with WOMAC-F among all patients. Among the THA and TKA groups, no significant correlations existed between WOMAC-F scores and reach distance in any individual direction.

Discussion and Conclusion: For patients undergoing primary unilateral TJA, YBT-LQ composite scores were moderately correlated with WOMAC-F. These data suggest that the YBT-LQ may be a simple, objective clinical measure that could potentially add to the currently administered battery of tests when determining postoperative functional status.

Notes:

1:18pm–1:24pm

Patient Perceived Outcomes and Physical Performance in TKA

Jesus M. Villa, MD
Carlos J. Lavernia, MD, FAAOS
David A. Iacobelli, MD
Mark D. Rossi, PhD, PT

Introduction: Patient's answers in questionnaires such as the WOMAC and SF-36 do not always correlate with the actual physical performance of the patients. We assessed the func-

tional performance of patients before surgery and compared it to the patient perceived outcomes.

Methods: We studied 51 patients undergoing primary TKA secondary to osteoarthritis. Patients were divided in two groups based on their preoperative ability to do a squat to 90 degrees (group 1=able; group 2=not able). The Timed Up and Go (TUG) test, PPO (WOMAC, QWB-7, SF-36) along with Knee Society Knee and Function Score (KSKS, KSFS), and Hospital for Special Surgery (HSS) scores were collected 2 weeks preoperatively in both groups. We compared the preoperative TUG, PPO, and knee scores within groups.

Results: Group 1 [19 patients (37%)] had significantly faster TUG performance (14.5 sec.), and better WOMAC total score (52.1), and QWB-7 (0.555) than group 2 (23.0 sec., 56.9, 0.529; respectively). Group 1 had significantly better KSKS (62.3), KSFS (49.5), and HSS Knee Score (67.3) when compared to group 2 (46.5, 38.1, 58.3; respectively). In group 1, correlations between TUG and PPO scores ranged from 0.02 (SF-36 social) to -0.7 (SF-36 role). The correlation coefficients ranged from 0.006 (SF-36 vitality) to -0.63 (KSFS) in group 2.

Discussion and Conclusion: Although some of the physical performance parameters correlated with patient oriented outcomes the global statistical agreement was weak. For patients who could squat to 90 degrees their PPO and knee scores were associated with faster mobility. PPO may be measuring attitudes and perceptions and not "real" outcomes.

Notes:

Thursday, July 17, 2014

Concurrent Session 4B: Spine *(Heritage Hall)*

Moderators: Robert M. Peroutka, MD

12:30pm–12:36pm

Operative Treatment of Combat-Related Spine Trauma (Crest) During the Conflicts in Iraq and Afghanistan

Scott C. Wagner, MD
Gregory S. Van Blarcum, MD
Daniel G. Kang, MD
Ronald A. Lehman Jr., MD

Introduction: Several recent studies have examined the rates of combat-related spinal injury sustained in Operations Enduring and Iraqi Freedom using joint trauma registries. We set out to describe the operative treatment of combat-related spine trauma over a ten-year period at three high-volume military treatment facilities.

Methods: A retrospective analysis of a surgical database at three military institutions was performed; patients undergoing spine surgery designated in as engaged in Operations Enduring and/or Iraqi Freedom between 01JUL2003 and 01JUL2013 were evaluated. Inclusion criteria included trauma sustained in direct relation to combat operations while in theater requiring operative treatment after evacuation to the United States. Demographic information, mechanism of injury and nature/location of spine injuries were recorded for all service members identified as undergoing surgery for combat-related spine trauma.

Results: 302 patients with combat-related (OIF/OEF) spine trauma requiring operative intervention were identified. 105 casualties required definitive surgical management after return to the United States. The mean age of these casualties was 29.8 years. 74.3% of these casualties were enlisted US Army servicemembers. 49.5% and 48.6% of injuries occurred in Afghanistan and Iraq, respectively. The most common mechanism of injury was mounted improvised explosive device (IED, 42.9%). The lumbar spine was the most commonly involved region (59%), followed by thoracic (43.8%), cervical (33.3%) and sacral (17.1%). 1.5 spinal regions were injured per patient, and two patients sustained injuries to all four spinal regions. Spinal cord injuries were present in 29.5% of all patients. The mortal-

ity rate for all patients after evacuation to the United States was 1.9%.

Discussion and Conclusion: Rates of combat-related spine trauma during the current Mideast conflicts is the highest in recorded history. This current retrospective study attempts to evaluate the demographic information, resource utilization and longer-term follow up data for patients sustaining war-related spine trauma requiring operative treatment.

Notes:

12:36pm–12:42pm

SOA Resident Travel Grant Award

Outcomes of Single-Level Cervical Disc Arthroplasty Versus Anterior Cervical Discectomy and Fusion: A Single Center, Retrospective Review

Scott C. Wagner, MD
Robert W. Tracey, MD
Daniel G. Kang, MD
John P. Cody, MD
Gregory S. Van Blarcum, MD
Michael Rosner, MD
Ronald A. Lehman Jr., MD

Introduction: Cervical disc arthroplasty has been espoused as a safe, segmental motion-sparing alternative to anterior discectomy and fusion in the treatment of cervical radiculopathy and myelopathy. Several studies have established the short-term safety and efficacy of cervical disc arthroplasty as compared to anterior discectomy and fusion. However, few single center comparative trials have been performed, and current studies do not contain large numbers of patients. We set out to perform a single center comparison of outcomes and complications following single-level cervical disc arthroplasty to single-level anterior cervical discectomy and fusion.

Methods: We retrospectively reviewed all patients from a single military tertiary medical center between August 2008 to August 2012 who underwent single-level cervical disc arthroplasty or single-level anterior cervical discectomy and fusion and compared their clinical outcomes and complications.

Results: A total of 259 consecutive patients were included in the study, 171 patients in the cervical disc arthroplasty group with an average follow-up of 9.8 (± 9.9) months and 88 patients in the anterior cervical discectomy and fusion group with an average follow-up of 11.8 (± 9.6) months. Relief of pre-operative symptoms was 90.1% in the cervical disc arthroplasty group and 86.4% in the anterior cervical discectomy and fusion group with rates of return to full pre-operative activity of 93.0% and 88.6% respectively. Patients who underwent cervical disc arthroplasty had a higher rate of persistent posterior neck pain (15.8% versus 12.5%), and patients who underwent ACDF were at risk for symptomatic pseudoarthosis at rate of 3.4%. Reoperation rates were higher in the anterior cervical discectomy and fusion group (5.7% versus 3.5%).

Discussion and Conclusion: This study represents the largest, non-funded retrospective comparison review of single-level CDA and single-level ACDF, and demonstrates that CDA is a safe and reliable alternative to ACDF.

Notes:

12:42pm–12:48pm

SOA/OREF Resident Award

Does Curve Magnitude/Deformity Correction Correlate with Pulmonary Function After Adult Deformity Surgery?

Gregory S. Van Blarcum, MD
Ronald A. Lehman Jr., MD
Daniel G. Kang, MD
Lawrence G. Lenke, MD
Jeffrey J. Stallbaumer
Brenda A. Sides, RN
Scott C. Wagner, MD

Introduction: The effect of surgical correction on pulmonary function of adult spinal deformity patients is unknown. The purpose of this study was to determine if a correlation exists between curve magnitude, deformity correction and post-operative pulmonary function (PFTs) following adult spinal deformity surgery.

Methods: We prospectively collected PFTs on 76 adult deformity patients (70F, 6M, avg age 41.2) undergoing primary surgical treatment for idiopathic scoliosis at a single institution and followed them for 2 years (avg 2.93). Radiographs for all pts were analyzed for main thoracic (MT) and sagittal T5-T12 (Sag) curve magnitude and correction.

Results: For all patients, there was a significant change in MT Cobb correction from 53.2 to 20.8 deg (avg -32.5 deg, p=0.00), Sag Cobb from 35.3 to 28.8 deg (avg -6.50 deg, p=0.00), and a significant decline in absolute and %pred PFTs after surgery, with %pred FEV1 and %pred FVC decreasing 5.86% (p=0.00) and 3.54% (p=0.01), respectively. We found pre-op MT curve magnitude significantly correlated (moderate, negative) with pre-op absolute and %predicted PFTs (r=0.364 to 0.506; p=0.001) respectively. The amount of MT deformity correction was also significantly correlated (weak, negative) with changes in %pred FEV1 and %pred FVC [change%pred FEV (r=-0.238, p=0.04); change%pred FVC (r=-0.249, p=0.03)], and there was no significant relationship between Sag deformity correction and PFTs.

Discussion and Conclusion: Preoperative MT curve magnitude negatively correlated with pre-op pulmonary function (PFTs). There was also a negative correlation between MT deformity correction and %pred PFT change. We found that greater MT curve correction may result in significantly less decline in pulmonary function (PFTs) than smaller curve corrections.

Notes:

12:48pm–12:54pm

Comparison of Pulmonary Function in Adults Younger and Older than Age 60 Undergoing Spinal Deformity Surgery

Scott C. Wagner, MD
Ronald A. Lehman Jr., MD
Daniel G. Kang, MD
Lawrence G. Lenke, MD
Jeffrey J. Stallbaumer
Brenda A. Sides, RN

Introduction: Our objective was to determine differences in pulmonary function in adult patients who are either younger (Y) or older (O) than age 60 following spinal deformity surgery, as older age may further exacerbate impairment of pulmonary function following spinal deformity surgery.

Methods: 128 consecutive adult deformity patients with idiopathic scoliosis undergoing surgical treatment were evaluated at a single institution with minimum two year follow-up. Prospectively collected PFTs, clinical records and radiographs were analyzed.

Results: There were 102 patients in Y group (average age 39.3±14.1 yrs) and 26 in O group (average age 63.7±2.7 yrs), with similar follow-up (Y=2.9 v O=2.6 yrs). There were no differences in average preoperative main thoracic curve; however, older patients had significantly greater number of lumbar (5.9 v 4.2), thoracic (9.1 v 7.3), and total (15.0 v 11.5) levels fused. We also found older patients had significantly lower absolute preoperative FEV1 (2.1 v 2.6L) and FVC (2.7 v 3.3L), but no differences in %pred PFTs. At two years,

lower absolute FEV1 (1.9 v 2.5L) and FVC (2.5 v 3.1L) were similar. A clinically significant decline in PFTs (greater than 10% pred FEV1) occurred in eight (31%) O patients and 26 (25%) Y patients, which was not statistically significant. We observed preoperative PFT impairment (less than 65%pred FEV1) in 1 (4%) O patient, which significantly increased to 6 (23%, p=0.02) O patients postoperatively, compared to no change in Y group (n=12, 12%) with PFT impairment.

Discussion and Conclusion: This is the largest study to date evaluating age related reduction in PFTs. Older patients have no significant difference in %predicted PFTs compared to younger patients postoperatively and no differences in the rate of clinically significant PFT decline (≥10% pred FEV1). However, older patients more frequently (23% v 12%) experience PFT impairment.

Notes:

12:54pm–1:00pm

Bilateral Pedicle Screw Fixation Provides Superior Biomechanical Stability in Transforaminal Lumbar Interbody Fusion: A Finite Element Study

Gregory S. Van Blarcum, MD
Divya V. Ambati, MS
Edward K. Wright Jr., PhD
Ronald A. Lehman Jr., MD
Daniel G. Kang, MD
Scott C. Wagner, MD
Anton E. Dmitriev, PhD

Introduction: Transforaminal lumbar interbody fusion (TLIF) is increasingly popular for the surgical treatment of degenerative lumbar disease. The optimal construct for segmental stability remains unknown. The purpose of this study was to compare the stability of fusion constructs using standard (C) and crescent-shaped (CC) polyetheretherketone (PEEK) TLIF cages with unilateral (UPS) or bilateral (BPS) posterior instrumentation. Five TLIF fusion constructs were compared using finite element (FE) analysis.

Methods: A previously validated L3-L5 FE model was modified to simulate decompression and fusion at L4-5 and used to analyze the biomechanics of various unilateral and bilateral TLIF constructs. The inferior surface of the L5 vertebra remained immobilized throughout load simulation, and a bending moment of 10 Nm was applied on the L3 vertebra to recreate flexion, extension, lateral bending and axial rotation. Various biomechanical parameters were evaluated for intact and implanted models in all loading planes.

Results: All reconstructive conditions displayed decreased motion at L4-5. Bilateral posterior fixation conferred greater stability when compared to unilateral fixation in left lateral bending. Over 50% of intact motion remained in left lateral bending with unilateral posterior fixation compared to less than 10% when bilateral pedicle screw fixation was used. Posterior implant stresses for unilateral fixation were six times greater in flexion and up to four times greater in left lateral bending compared to bilateral fixation. No effects on segmental stability or posterior implant stresses were found. An obliquely-placed, single standard cage generated the lowest cage-endplate stress.

Discussion and Conclusion: TLIF augmentation with bilateral posterior fixation increases fusion construct stability. The shape or number of interbody implants does not appear to impact segmental stability with bilateral pedicle screws. Increased posterior instrumentation stresses were observed in all loading modes with unilateral pedicle screw/rod fixation, which may theoretically accelerate implant loosening or increase the risk for construct failure.

Notes:

1:00pm–1:06pm

Pedicle Screw Re-Insertion Using Previous Pilot Hole and Trajectory Does Not Reduce Fixation Strength

Scott C. Wagner, MD
Daniel G. Kang, MD
Adam Bevevino, MD
Ronald A. Lehman Jr., MD
Rachel Gaume, BS
Robert W. Tracey, MD
John P. Cody, MD

Introduction: Often during pedicle screw instrumentation, the insertion tract must be palpated to reassess for pedicle wall violation. If no violation is found, the same screw may be re-inserted along the same trajectory. Previous studies have reported significantly decreased insertional torque during this reinsertion. However fixation strength has never been evaluated biomechanically.

Methods: Thirty-one thoracic and nine lumbar individual fresh-frozen human cadaveric vertebral levels were evaluated. Each level was instrumented bilaterally with multi-axial pedicle screws. A paired comparison was performed for each level, randomized between control and test group with screw reinsertion, which was performed by completely removing the pedicle screw, palpating the tract, and then re-inserting along the same trajectory. Screw insertional torque (IT) was measured, and peak IT reported in inch-pounds (in-lb). Pullout strength (POS) was measured in Newtons (N).

Results: There was no significant difference detected for pedicle screw POS between re-inserted (RI) and control screws (732±307 N versus 742±320 N, respectively). However, IT for RI screws (5.14±4.18 in-lb) was significantly decreased compared to the initial screw (INI) and control screws (29% and 33% decrease, respectively). There was no significant difference for pedicle screw POS between RI and control screws (943±344N versus 803±422N) in the lumbar spine, as well as a significant IT decrease between RI and control screws (6.38±4.61 in-lb versus 9.56±3.84 in-lb). Test group screws in both the thoracic and lumbar spine had strong correlations between initial screw IT and pullout strength (r=0.79; r=0.93). There was a moderate correlation between re-insertion IT and pullout strength in the thoracic spine (r=0.56), but no significant correlation for the lumbar spine (r=0.218).

Discussion and Conclusion: We found no significant difference in pedicle screw pullout strength after re-insertion. Therefore, re-insertion along the same trajectory may be performed without significantly compromising screw fixation strength.

Notes:

1:06pm–1:12pm

Lateral Lumbar Interbody Fusion for the Correction of Spondylolisthesis and Adult Degenerative Scoliosis in High-Risk Patients: Early Results and Complications

Bradford S. Waddell, MD
David Briski, MD
Brandon W. Cook, MD
Joseph M. Zavatsky, MD

Introduction: Interbody fusion using cages has traditionally been performed using anterior (ALIF) or posterior (PLIF, TLIF) techniques. Lateral lumbar interbody fusion (LLIF) by a transpsoas approach has been described. This approach can avoid many of the complications seen in other techniques. Lateral cages also offer the benefit of a larger cage, lending to its potential increased stability by spanning the ring apophysis. Furthermore, there is a greater space to house more graft material with increased surface area. Computerized tomography (CT) has been shown to produce more reliable results in assessing interbody fusion in spinal surgery. Patients with multiple co-morbidities, including smoking, diabetes and obesity, have been shown to have decreased fusion rates. The purpose of this study was to use CT scans to assess interbody fusion rates utilizing the LLIF technique in high-risk patients having multiple co-morbidities.

Methods: We performed a retrospective review of patients who underwent LLIF between January 2008 and July 2013. Forty-nine patients with 119 levels underwent non-staged or staged LLIF with posterior correction and augmentation. Per protocol, patients received CT scans at their 1-year follow-up. Of the 49 patients, 21 patients with 54 levels met inclusion criteria. Two board-certified musculoskeletal radiologists and the senior surgeon (JZ) assessed fusion.

Results: We performed 6 revision surgeries (28.6%) and other co-morbidities included osteoporosis (23.8%), osteopenia (42.9%), diabetes (19.1%), obesity (38.1%) and smoking (9.5%), among others. Postoperative complications occurred in 12 patients (57.1%) and included anterior thigh pain and weakness in 5 patients (23.8%), all of which resolved by 6 months. There were two cases of proximal junctional kyphosis, both requiring revision and cranial extension, and one case of hardware pull out. There were two cases of abdominal atonia, one of which resolved at one year and the other still symptomatic at a year and a month. There were no cases of infection, ileus, UTI, catastrophic subsidence, DVT or PE. By CT scan assessment, each radiologist found solid fusion, as demonstrated by strong bridging trabeculae, was achieved in 53 out of 54 levels (98%). This was in agreement with the senior surgeon.

Conclusion: Several studies have evaluated LLIF fusion and reported fusion rates between 88-96%. Our results demonstrate high fusion rates (98%) using this technique, despite multiple co-morbidities. Since stability plays a vital role in successful fusion, spanning the ring apophysis with the cage, along with pedicle screw supplementation, appear to be key factors. This stability, increased graft material and a larger surface are could mitigate the negative effects of the co-morbidities on fusion.

Notes:

1:12pm–1:18pm

Incidence of Lumbar Plexopathy While Utilizing Mechanomyography (MMG) as an Alternative to Electromyography (EMG) for Trans-Psoas Lateral Lumbar Interbody Fusion (LLIF)

Brandon W. Cook, MD
Bradford S. Waddell, MD
David Briski, MD
Joseph M. Zavatsky, MD

Introduction: Previous studies utilizing EMG have reported that the incidence of thigh complications during trans-psoas lateral lumbar interbody fusion (LLIF) range from 0.7% to 75%. The reliability of electromyography (EMG) has been questioned due to false-positives, false-negatives, and electrical interference from common operating-room equipment. MMG may provide an alternative to EMG for neuromonitoring. In this study, we evaluated the incidence of thigh complications during trans-psoas LLIF utilizing MMG to monitor the lumbar plexus.

Methods: A retrospective review of prospectively collected data of 4 different surgeons at 4 separate institutions was performed. Eighty-five consecutive patients, with175 instrumented levels, underwent trans-psoas LLIF surgery (L1-L5) during a 1-year period were included. Immediate post-operative and routine follow-up clinical exams at 3, 6, and 12 months were obtained.

Results: The rate of all ipsilateral thigh symptoms (pain, numbness, and weakness) was 21.2% (18/85). Eight patients (9.4%) had iliopsoas or quadriceps weakness (3/5 motor strength). Ten patients (11.8%) had anterior thigh pain and / or numbness. Most patients with post-operative thigh symptoms (16/18) had 3 or 4 level procedures performed for adult degenerative scoliosis (ADS) and included the L45 level. All thigh symptoms resolved within 3 months.

Conclusion: MMG is a neuromonitoring technique that functions by measuring the mechanical activity in muscles, or 'twitch', non-invasively using surface-mounted accelerometers on the skin following nerve stimulation and muscle contraction. MMG is an effective alternative to EMG for nerve mapping during trans-psoas LLIF surgery and overcomes deficiencies related to the high rates of false-positives and false-negatives inherent to EMG. Additionally, unlike EMG, MMG is not affected by electrical artifact seen with common

operating-room equipment like the cautery and body warmer. With the use of MMG, the rate of ipsilateral thigh symptoms was 21.2%, which is consistent with currently reported rates for trans-psoas LLIF procedures utilizing EMG. In our study, most thigh symptoms occurred in patients with multi-level LLIF procedures performed and direct trauma to the psoas may have contributed to our results and the actual rate of nerve related thigh symptoms might be lower. All symptomatic patients had L45 included in their construct. MMG is a safe alternative to EMG to monitor the lumbar plexus when performing trans-psoas LLIF.

Notes:

2014 Scientific Program Abstracts — Friday McCoy's Peak Room Gerald Ford Hall

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

Friday, July 18, 2014

General Session 5: Upper Extremity

Moderator: J. Mack Aldridge, MD

6:35am–6:41am

SOA/OREF Resident Award

Fracture Displacement and Neurological Injury in Supracondylar Humerus Fractures in Children

Brian E. Etier Jr., MD
Evan Sheppard
Joseph G. Khoury
Shawn R. Gilbert

Introduction: The purpose of this study was to evaluate the rate of nerve injury with supracondylar humerus fracture and relate to direction of fracture displacement.

Methods: The database of surgical procedures for five pediatric orthopaedic surgeons at a single institution was queried for operative treatment of supracondylar humerus fractures from 2009-2012. Four hundred patients were identified who underwent open or closed reduction and pinning. Records were reviewed for patient age, gender, weight, mechanism of injury, time to reduction, nerve injury, and time to resolution. Radiographs were used to classify fracture type and direction of displacement.

Results: Of the four hundred patients, two-hundred sixteen (54%) were male. Average age was 5.8 years. Forty-three patients (11%) had pre-operative nerve injury, (mean age 5.7 years, 56% male, mean weight-for-age percentile 75.8). The anterior interosseous nerve was most commonly injured (28 patients, 7%). Twenty-one of these patients had posterolateral fracture displacement, six had posterior fracture displacement, and one patient had posteromedial fracture displacement. Twelve patients (3%) had posterior interosseous nerve palsies; all had posteromedial fracture displacement. Two patients (0.5%) had radial nerve palsies, both with posteromedial fracture displacement. One ulnar nerve palsy (0.25%) was identified in a patient with anterior medial fracture displacement. Thirty-seven patients with nerve injury (86%) had clinical neurologic improvement at last clinical follow up. The average time to improvement was forty-two days (median 32 days, range 6-88 days). Six patients (14%) had no clinical improvement before being lost to follow up at an average of 34 days. Twenty-nine patients (67%) had complete neurologic recovery at an average of eight-eight days (median 81 days, range 6-284 days). Fourteen patients (32%) did not have full recovery at last clinic evaluation at an average of 47 days following surgery. Only one patient without documented resolution of nerve injury had follow up over 90 days.

Discussion and Conclusion: Anterior interosseous nerve palsy is the most common nerve injury with supracondylar fractures and usually occurs with posterolateral fracture displacement. Posterior interosseous and radial nerve palsy occurred exclusively with posteromedial fracture displacement. Ulnar nerve palsy occurred with anterior medial fracture displacement. Most patients with nerve injury had improvement or resolution by three months. This is the largest series of supracondylar fractures studied to document nerve injuries and correlate with direction of nerve displacement. The overall rate of nerve injuries is consistent with meta-analyses. Information on time to nerve recovery may aid in counseling patients.

Notes:

6:41am–6:47am

Aid to Reduction of Type 2 and 3 Supracondylar Elbow Fractures Using a Percutaneous Posterior Pin

Steve A. Lovejoy, MD

Introduction: To report on the safety and efficacy of a percutaneous pin technique to aid in reduction of supracondylar elbow fractures in children

Methods: 87 consecutive Type 3 supracondylar elbow fractures were reviewed between May of 2006 and May of 2007. Using the anterior humeral line intersecting the anterior to middle third of the capitellum, lateral distal humeral angle of 35 to 40 degrees, and comparable Bohler's angle as a guide, 23 of these were considered unacceptable after best closed reduction was performed. The aid to reduction of a posterior percutaneous pin perpendicular in the fracture, then angling proximal 45 degrees (also known as the Kaponje technique) was performed.

Results: 22 of the previously unacceptable reductions now fit the criteria for an acceptable reduction. Standard pinning techniques were then used to complete the procedure and the posterior pin was removed. No vascular injuries or degradation of neurologic status was identified.

Discussion: Using a percutaneous posterior pin as an aid to reduction in displaced supracondylar elbow fractures is safe, effective, and useful in avoiding open reduction of these fractures.

Notes:

6:47am–6:53am

Distribution of the Volar and Dorsal Blood Supply of Lunate; An Anatomic Specimen Study of 1900 Lunate Bones

Navkirat S. Bajwa, MD
Frederick N. Meyer, MD
Nicholas U. Ahn, MD

Introduction: The exact cause of Kienbock's is not known, though a number of studies have proposed various vascular and mechanical factors. Kienböck theorized that lunatomalacia was the result of atraumatic disruption of the blood supply to the lunate and subsequent disturbance of the bony nutrition. It is unclear as to whether volar or dorsal arteries supply the majority of blood supply to lunate. The aim of this anatomic study is to examine and evaluate the nutrient foramina of the dorsal and the volar aspect of lunate specimens.

Methods: 1900 wrists from 950 cadaveric human specimens from the Hamann-Todd osteological collection in Cleveland, Ohio were examined. The nutrient artery foramina on left and right lunate bones of each specimen were examined from the dorsal and volar aspects. The number of nutrient artery foramen was tabulated. Baseline data of age, sex and race of the specimen were collected. Specimens were divided into various groups according to the number of nutrient artery foramen and the dorsal and volar foramina were compared.

Results: Overall, the average numbers of foramina on the dorsal aspect of lunate were greater than the volar aspect. In specimens less than 35 years of age, there were more nutrient artery foramina on the volar aspect compared to the dorsal aspect.

Conclusion: Based on our study of a large population of adult skeletal specimens, it appears that there is significant contribution of dorsal arterial vessels to the blood supply of lunate bone in specimens over 35 years of age. This is in contrast to findings in earlier studies. The disruption of dorsal intercarpal and radiocarpal ligaments leading to the disruption of the dorsal arterial arches may be a major contributor to vascular insufficiency of lunate bone.

Notes:

6:53am–6:59am

Effects of Upper Extremity Immobilization and Use of a Spinner Knob on Vehicle Steering

Lyle Jackson, MD
Matthew Crisler, PhD
Stephanie L. Tanner, MS
Johnell Brooks, PhD
Kyle Jeray, MD

Introduction: Driving ability while an upper extremity is immobilized is not well elucidated. It is assumed steering reaction time and accuracy correlate with ability. A steering wheel spinner knob is an aftermarket device that allows for one-handed steering. The goal of this study was to examine the effect of upper extremity immobilization on steering reaction time and accuracy with and without a spinner knob.

Methods: Twenty healthy, right-handed subjects (equal males/females) were enrolled in this cross-over trial using a high-fidelity driving simulator. Five right-sided immobilization conditions were tested in a counterbalanced order: no immobilization (control), off-the-shelf wrist splint, sugar-tong splint, and the two splints with a left-hand spinner knob. Steering reaction time and accuracy (number of errors on a steering tracking task at two difficulty levels) were measured. Subjects were allowed to steer with the immobilized extremity and use was estimated. An alpha of 0.05 was used.

Results: No significant differences in reaction time were observed between any conditions. Both immobilized conditions and difficulty levels had diminished accuracy compared to controls with significantly higher errors. Mean number of errors (standard error) for the easier/harder difficulty levels respectively were: control 0.3(+/-0.2)/7.6(+/-0.7), wrist splint 0.9(+/-0.3)/10.9(+/-1.2), spinner knob wrist splint 1.2(+/-0.3)/12.2(+/-1.4), sugar-tong 1.8(+/-0.6)/12.4(+/-1.8), spinner knob sugar-tong 0.5(+/-0.2)/13.0(+/-1.0). The spinner knob did significantly improve the accuracy for the sugar-tong splint during the easier task, but this improvement was not observed in the harder task. There were no differences between conditions based on gender or observed use of the immobilized arm.

Discussion and Conclusion: Immobilization regardless of spinner knob use did not significantly impact steering reaction time. However, immobilization did have a negative effect on steering accuracy for both the wrist splint and the sugar-tong splint. The steering wheel spinner knob did not consistently improve accuracy and further study is needed to determine its utility.

Notes:

6:59am–7:05am

Factors Affecting the Length of Stay After Shoulder Arthroplasty

Joseph J. King, MD
Matthew Patrick, MD
Ryan Schnetzer, MD
Aimee M. Struk, MEd, MBA
Cynthia Garvan, PhD
Kevin W. Farmer, MD
Thomas W. Wright, MD

Introduction: This study is designed to determine the preoperative, operative, and postoperative factors associated with a greater length of stay after shoulder arthroplasty.

Methods: A retrospective review was performed identifying all patients that underwent shoulder arthroplasty between 2007-2010. Medical records were reviewed for demographic, operative, and clinical information. Inclusion criteria were any shoulder arthroplasty performed by the senior surgeon. Length of stay was defined as the number of nights of hospitalization. Preoperative, operative, and postoperative factors were evaluated for their association with length of stay in a univariate model. Preoperative diagnosis was divided into 4 categories: 1) osteoarthritis, cuff tear arthropathy, massive rotator cuff tear, or avascular necrosis, 2) acute fracture or fracture sequelae, 3) inflammatory arthropathy, and 4) failed shoulder arthroplasty. Significant factors were then evaluated in a multivariate model (Poisson regression).

Results: Four-hundred and twenty-five shoulder arthroplasties (207 females, 218 males) were identified. Average age at surgery was 66.9 years. The procedure performed had a significant impact on length of stay with revision arthro-

plasty and antibiotic spacer placement having the longest hospitalizations. Factors found to be insignificant in univariate analysis were age, BMI, heart disease, kidney or liver disease, prior shoulder surgery, and preoperative hematocrit. Factors found to be significant in bivariate analysis, but not in multivariate analysis were gender, ethnicity, hypertension, significant preoperative anticoagulation, estimated blood loss, and postoperative hematocrit. Significant factors associated with longer hospitalization by multivariate analysis were diabetes, ASA score of 3 or 4, diagnosis of acute fracture or fracture sequelae, diagnosis of inflammatory arthropathy, diagnosis of failed shoulder arthroplasty, and blood transfusion.

Conclusion: Preoperative factors that affect length of stay after shoulder arthroplasty are diabetes, ASA score, and preoperative diagnoses of fracture, fracture sequelae, inflammatory arthritis, and failed shoulder arthroplasty. Blood transfusion is the only postoperative factor that affected length of stay.

Notes:

7:05am–7:11am

Clinical Outcomes of a Novel Figure-of-Eight Sternoclavicular Joint Reconstruction Technique

Jefferson Bradley Sabatini, MD
Joseph R. Shung, BS, MS-IV
T. Bradly Clay, MD, PGY-I
Lasun O. Oladeji, MS
Brent A. Ponce, MD

Introduction: Sternoclavicular joint (SCJ) instability is a relatively rare condition which can limit function and cause shoulder girdle pain. Various methods for stabilizing the SCJ have been proposed with biomechanical analysis demonstrating superior stiffness and peak-load properties using a figure-of-eight tendon graft technique. The purpose of this study is to evaluate the clinical outcomes of SCJ reconstruction using a novel figure-of-eight allograft tendon technique.

Methods: A retrospective analysis of a consecutive cohort of patients from 2007-2011 was performed. All patients were treated for SCJ instability with a figure-of-eight allograft reconstruction augmented with two tenodesis screws. Outcomes were assessed with the American Shoulder and Elbow Surgeons score (ASES), the Disabilities of the Arm, Shoulder, and Hand score (Q-DASH), and the Visual Analog Pain Scale (VAS).

Results: Eleven patients were evaluated with an average follow-up of 25 months (range 9.9-66.8). All patients reported a preoperative ASES score equal to or below 40. Mean ASES score improvement following reconstruction was 49.9 points (range 28.3 to 80) with an average postoperative ASES score of 83.41 (range 63.3 to 95 points). Mean follow up VAS score up was 1.77 (range 0 to 6) and the mean Q-DASH score was 20.2 (range 0 to 38.6). All patients reported that they would repeat the procedure, and 91% would not hesitate to recommend the procedure to a friend with the same condition. One patient required removal of prominent suture wad, and another patient developed a postoperative hematoma requiring irrigation and debridement. No complications were encountered with using tenodesis screws for interference fixation of the graft**.**

Discussion and Conclusion: Figure-of-eight allograft tendon SCJ reconstruction with tenodesis screws effectively and consistently improved shoulder outcomes in patients with SCJ instability.

Notes:

Friday, July 18, 2014

General Session 6: Sports Medicine

Moderator: Frederick M. Azar, MD

7:25am–7:31am

Multi-Rater Agreement of the Etiology of ACL Reconstruction Failure. A Radiographic and Video Analysis of the Mars Cohort

Matthew J. Matava, MD

Introduction: ACL reconstruction failure occurs in up to 10% of cases. The purpose of this study is to test the hypothesis that experienced knee surgeons have a high level of agreement as to graft location, graft characteristics, and etiology of failure of primary ACL reconstruction.

Methods: 20 cases of revision ACL reconstruction were randomly selected from the MARS database. Each case included the patient's history, standardized radiographs, and a concise 30-second arthroscopic video taken at the time of revision demonstrating the graft remnant and location of the tunnel apertures. All 20 cases were reviewed by 10 MARS surgeons not involved with the primary surgery. Each surgeon completed a two-part questionnaire dealing with each surgeon's training and practice as well as the placement of the femoral and tibial tunnels, condition of the 1° graft, and the surgeon's opinion as to the etiology of graft failure. Inter-rater agreement was determined for each question. Kappa statistics were used, when appropriate, based on the prevalence index. A prevalence adjusted bias adjusted kappa (PABAK) was used to adjust the kappa for the paradoxes caused by large differences between the two types of agreement (prevalence) or the two types of disagreement (bias).

Results: The 10 reviewers were in practice an average of 14 years. All performed at least 25 ACL reconstructions per year and 9 were fellowship-trained in sports medicine. Inter-observer agreement was 77% (PABAK: 0.55) when determining if the femoral tunnel was ideal in placement and size compared to 58% (PABAK: 0.17) agreement for the tibial tunnel. Seventy-three percent of the reviewers agreed on femoral tunnel verticality (PABAK: 0.46). The percent agreement averaged only 72% for the etiology of graft failure. When specifically asked about technical error as the etiology for failure, inter-observer agreement was only 63%.

Conclusion: There is moderate agreement among knee experts on ideal femoral tunnel placement but only slight agreement for ideal tibial tunnel placement. Similarly, there is only fair agreement whether a femoral tunnel is too anterior or too vertical and only slight agreement as to the specific etiology of graft failure. This study suggests that more objective measures are needed to accurately determine ideal femoral and tibial tunnel placement as well as the etiology of primary ACL graft failure.

Notes:

7:31am–7:37am

Pre-Operative Templating of Anterior Cruciate Ligament Reconstruction Using Lateral X-Ray to Prevent Graft Tunnel Mismatch

LCDR Patrick W. Joyner, MD, MS
Travis S. Roth, MS-IV
Luke Wilcox, DO
Ryan Hess, MD
Jeremy Bruce, MD
Christopher O'Grady, MD
Charles A. Roth, MD

Introduction: Anterior cruciate ligament reconstruction (ACLR) with bone-patella-tendon-bone (BTB) autograft or allograft can be complicated by graft tunnel mismatch. We investigate the lateral knee X-ray as a template to help calculate tibial tunnel length pre-operatively. The similarity between Blumensaat's line and the reconstructed anterior cruciate ligament (ACL) length was a secondary outcome measure.

Methods: 20 consecutive ACLR were performed (13 male, 7 female); all were BTB autograft. Average patient age was 27.8±11.8 years. All ACLR were performed anatomically with independent drilling of the femoral and tibial tunnels. Lateral X-Rays were obtained prior to ACLR. The length of Blumensaat's line and the patellar ligament were recorded. The overall graft length was calculated from the patellar ligament

length on lateral X-ray; subsequently, Blumensaat's line was used to calculate the tibial tunnel length. All pre-operative calculations; Blumensaat's line, patellar ligament, overall graft, and tibial tunnel lengths; where compared to their respective intra-operative measurements. The amount of graft protrusion or recession in the tibial tunnel was measured at the end of the case; effectively the length of graft tunnel mismatch.

Results: The average difference between the length of Blumensaat's line and the reconstructed ACL was 1.4±1.2mm, pre-operative and intra-operative tibial tunnel was 4.5±4.5mm, and the average graft tunnel mismatch was 2.1±2.6mm. The mean percent difference between Blumensaat's line and reconstructed ACL was 0.72% and pre-operative and intra-operative tibial tunnel length was 6.43%. The correlation coefficient (greater than 0.8 is excellent, less than 0.2 is poor) for Blumensaat's line and the reconstructed ACL was 0.81.

Conclusion: This method of pre-operatively templating an ACLR and calculating the tibial tunnel length is effective in minimizing the risk of graft tunnel mismatch when using BTB auto and allografts. Additionally, we demonstrated that Blumensaat's line is essentially the same length as the reconstructed ACL.

Notes:

7:37am–7:43am

Comparison of Clinical Testing and Functional Movement Testing in Patients Following Anterior Cruciate Ligament Reconstruction: Improving Return to Sport Guidelines

Stephanie W. Mayer, MD
Eziamaka Okafor
Robert J. Butler, DPT, PhD
Robin M. Queen, PhD
William E. Garrett, MD, PhD

Introduction: The purpose of this study was to compare traditional clinical testing methods to functional testing including the Functional Movement ScreenTM (FMS) and the Y-Balance Tests (YBT) in detecting deficits following ACL reconstruction. Our hypothesis was that there would be persistent deficits on functional testing in many athletes who were cleared for return to sport by clinical guidelines.

Methods: A retrospective review of 98 patients evaluated with traditional clinical testing as well as FMS and YBT functional testing was undertaken. Patients were grouped based on whether or not they were clinically cleared for return to sport at the time of their functional testing as well as those who underwent primary or revision surgery. A two-tailed t-test was used to compare composite scores and number of asymmetries between the operative and well leg on FMS and YBT testing between groups.

Results: There was no statistical significance between patients who were clinically cleared versus not clinically cleared in FMS composite scores (12.73 vs 12.82), side to side asymmetries on FMS testing (1.03 vs 0.93), composite YBT scores of the operative leg (93.10 vs 93.37), or composite YBT scores of the well leg (95.45 vs 95.23). There was no difference in FMS composite scores, side to side asymmetries, or composite YBT scores between the primary and revision groups. The mean of all patients was below the threshold FMS score of 14 known to put a patient at risk for lower extremity injury.

Discussion and Conclusion: Given the similar scores on FMS and YBT testing in patients who were clinically cleared to return to sport, our current clinical criteria may not detect deficits in neuromuscular control which place these patients at continued risk for re-injury. Functional Movement Score and Y-Balance testing may be a useful adjuvant to detect these deficits and individualize rehab protocols.

Notes:

7:43am–7:49am

Rates and Determinants of Return to Play After Anterior Cruciate Ligament Reconstruction in Division I College Soccer Athletes: A Study of the Southeastern Conference

Darren L. Johnson, MD
Mark L. Lembach, MD
Adam V. Metzler, MD
Jennifer S. Howard, PhD, ATC

Introduction: We sought to determine the overall return to play (RTP) rate of female collegiate soccer athletes after anterior cruciate ligament (ACL) reconstruction in the Southeastern Conference (SEC). Additionally, we examined the effect of athlete and surgical technique related variables on RTP.

Methods: Medical staff at all SEC member institutions were contacted to request participation in the study. Institutions were sent a data sheet with standardized response choices and instructions regarding athlete inclusion criteria for ACL reconstructions performed at the participating institutions over the previous 8 years. Chi square analyses were used to compare RTP rate by athlete and surgical characteristics.

Results: Seventy-nine reconstructions were reported with RTP data available for seventy-eight women soccer athletes. RTP rates favored athletes in earlier years of eligibility versus later years. Overall RTP rate was 84.6%l; however, athletes in eligibility years 4 and 5 combined had a RTP rate of 40%. RTP also differed based on scholarship status (scholarship athletes 91% vs. non-scholarship athletes 45.5%). Athlete position and depth chart status showed no effect on RTP. RTP for autograft (87.9%), allograft (75%), and combined graft (50%) demonstrated no difference. RTP rates were similar for patellar tendon autograft and hamstring autograft. Femoral tunnel drilling technique showed no effect on RTP for transtibial, accessory medial portal, or two incision techniques. When comparing multiple graft fixation constructs, no RTP difference were observed. RTP in isolated ACL reconstruction (77.3%) versus ACL reconstruction with concomitant procedures (88.9%) showed no difference. RTP rate was not significantly different between players undergoing revision ACL reconstruction (77.3%) versus primary (87.3%).

Discussion and Conclusion: Undergoing ACL reconstruction earlier in the college career before the 4th year of eligibility as well as the presence of a scholarship had a positive effect on RTP. Surgical factors including graft type, fixation methods, tunnel placement technique, concomitant procedures and revision status demonstrated no significant effect on RTP rate.

Notes:

7:49am–7:55am

Survivability of Surgical Repair and Recurrence of Shoulder Instability in a Young, Active Population

James H. Flint, MD
*CPT Adam M. Pickett, MD
LTC Brett D. Owens, MD
LTC Steven J. Svoboda, MD
Kenneth L. Cameron, PhD
CDR John C. Biery Jr., DO
CDR John-Paul Rue, MD

Introduction: Shoulder dislocation and symptomatic instability are significant topics of discussion among the orthopaedic sports literature. We sought to evaluate the incidence of recurrence of glenohumeral dislocation/instability in patients matriculating to the either the USNA or USMA with prior surgical repair of glenohumeral instability during their 4 years of school, as well as the implications of recurrent injury (and sometimes recurrent surgical repair) on graduation and occupation selection.

Methods: We conducted a retrospective review of approved medical waivers for preexisting shoulder instability or dislocation and underwent surgical treatment prior to matriculation at the USNA & USMA over a four-year period. These patients were followed for the entirety of their rigorous training at their respective military academy. They were then divided into two groups, those who had recurrent instability and those who did not. Statistical analysis was performed to identify risk factors for recurrence, graduation, and service selection.

Results: 59 patients with preexisting shoulder conditions were identified and met inclusion criteria, with the majority

of preexisting injuries resulting from participation in a contact sport prior to matriculation (66%). 32% (19/59) of patients had recurrence of symptomatic shoulder instability or dislocation. We found no association between age and recurrence of shoulder instability/dislocation. However, 100% of females had recurrence of injury, compared to only 29% of males (p=0.030). There was a significant risk of recurrent injury in athletes participating in non-contact sports (p=0.002). Recurrent shoulder injury had no significant impact on graduation or ultimate military occupation.

Discussion and Conclusion: Our analysis, derived from multi-center data, shows a 32% incidence of recurrent dislocation or symptomatic instability, with a significant predilection for female athletes and those participating in non-contact sports. This study provides valuable information regarding survivability of prior surgical repair and recurrence rates of shoulder injury among a physically demanding patient population, military or civilian.

Notes:

7:55am–8:01am

Biomechanical Comparison of Torque to Humeral Fracture Between Two Bony Biceps Tenodesis Locations

Arash A. Dini, MD
Felix. H. Savoie III, MD
Michael J. O'Brien, MD

Introduction: Tenodesis of the long head of the biceps to either bone or soft tissue is the preferred surgical treatment for refractory tendinosis and other pathology of long head of the biceps tendon in the young and active patient. Although a variety of options for humeral fixation exist, biointerference screws have gained popularity as one option for fixation of the tendon to the humerus in both open and arthroscopic techniques. Fracture is a known complication of subpectoral tenodesis. At our institution, placement of the screw at the bottom of the bicipital groove above the pectoralis major tendon is the preferred location. The purpose of our study is to compare the likelihood of spiral fracture of the humerus following bony biceps tenodesis at the bottom of the bicepital groove with the sub-pectoral diaphyseal location.

Methods: Eight fresh-frozen humeri (4 matched pairs) were dissected. Unicortical screw holes were drilled in either of two locations: within the bottom of the bicipital groove (Group 1 - right shoulders), or just below the pectoralis major tendon insertion (subpectoral) in the humeral diaphysis (Group 2 - left shoulders). External rotation torque was applied to each humerus distally until fracture occurred, with torque measured in Newton-meters.

Results: Fracture occurred at the subpectoral cortical drill hole in 3 of 4 specimens (Group 2). No fracture occurred through the bicipital groove cortical drill holes, with spiral fracture resulting in the diaphysis of the humerus in 3 of 4 specimens (Group 1). Average torque to failure for Group 1 was 28.86 N-m. Average torque to failure for Group 2 was 21.49 N-m. The results were statistically significant.

Conclusion: Subpectoral cortical drill holes for tenodesis screws were shown as a stress riser for humeral spiral fracture in our model. Bicipital groove cortical drill holes were not shown as a stress riser.

Notes:

Friday, July 18, 2014

Concurrent Session 8A: Foot & Ankle *(McCoy's Peak Room)*

Moderator: Mark E. Easley, MD

12:30pm–12:36pm

Tibiotalar Arthrodesis Takedown with Total Ankle Arthroplasty

Manuel J. Pellegrini, MD
Adam P. Schiff
Samuel B. Adams Jr., MD
Robin M. Queen, PhD
James K. DeOrio, MD
Mark E. Easley, MD
James A. Nunley II, MD

Introduction: Conversion of ankle arthrodesis to total ankle arthroplasty (TAA) remains controversial. Although satisfactory outcomes have been published; not all foot and ankle surgeons performing TAA have embraced this surgical practice.

Methods: 23 ankles were converted (23 patients) from painful ankle arthrodesis to TAA. Mean patient age at surgery was 59 years (41-80). Mean followup was 33.1 months (minimum FU, 12 months). Indications included 14 ankle fusions with symptomatic adjacent hindfoot arthritis and 9 symptomatic ankle non-unions. Two of the painful ankle arthrodesis had been performed with distal fibulectomy. We evaluated SF-36 scores, SMFA, VAS and the AOFAS hindfoot-ankle scores preoperatively, at one year and at most recent followup. We assessed radiographic alignment and component position at 3 time points. 1X3 repeated measures ANOVA was performed to determine changes in all outcome measures across time and Chi-squared was applied for ordinal data.

Results: Mean preoperative VAS was significantly reduced, with 5 patients (22%) pain free (VAS=0). Preoperative SMFA bother index significantly improved. SF-36 total score significantly improved from 34.5±18.6 to 55.2±23.2 and 47.7±23, respectively. AOFAS total score significantly increased from 15.8±6.1 to 35.5±13.45 and 40.5±8.8, respectively. At most recent followup, average active ankle ROM was 2+2.9º of dorsiflexion and 19+9º of plantarflexion. Implant survival rate was 87%. Ten patients (43%) had minor complications not requiring repeat surgery. Initial implant settling that stabilized was observed in 3 (13%) tibial and 4 (17%) talar components. Three ankles (13%) had talar subsidence requiring revision. Both TAA conversions for ankle arthrodesis performed with distal fibulectomy failed.

Discussion: At early-to-intermediate follow-up, conversion of painful ankle arthrodesis to TAA led to pain relief and improved function in a majority of patients. The complication rate is concerning, particularly talar component settling and subsidence. We do not recommend the procedure for ankle arthrodeses that included distal fibulectomy.

Notes:

12:36pm–12:42pm

Comparison of Total Ankle Arthroplasty for End Stage Ankle Arthritis in Varus and Neutral Alignment

Alan Y. Yan, MD
Samuel B. Adams Jr., MD
James K. DeOrio, MD
Mark E. Easley, MD
James A. Nunley II, MD

Introduction: Recent literature suggests that outcomes of total ankle arthroplasty performed for moderate varus ankle arthritis may approach outcomes for TAA performed for ankle arthritis in neutral alignment; many suggest that TAA for varus ankle arthritis exceeding 20 degrees is contraindicated. Over a four-year period, we compared outcomes for TAA performed for varus ankle arthritis to results of TAA performed for arthritis in neutral alignment.

Methods: From October 2007 to October 2011, we prospectively followed 279 TAAs: Group 1 of 66 ankles with varus ankle arthritis from 5 degrees to 36 degrees and Group 2 of 213 ankles in neutral alignment. Preoperative and postoperative outcome measures included SF36, SMFA, VAS, FADI and AOFAS scores. Need for associated procedures was also compared. We assessed radiographic ankle alignment. A t test was used with SAS v 9.2.

Results: With a minimum of 2 year follow up, we observed no significant differences in the two cohorts' co-morbidities, BMI, smoking history and age. Although SF36 and AOFAS scores were significantly worse in Group1 than Group 2, we observed no significant differences in the mean improvement of the outcome measures in SF36, SMFA, VAS, FADI and AOFAS scores in the 2 groups. Group 1 required significantly more associated procedures. 65 of 66 varus ankles were corrected to neutral with a mean of 0.9 degree postoperatively. 62 of 66 ankles have maintained neutral at the last follow up with a mean of 1.02 degree. There were 3 cases of implant failure.

Discussion and Conclusion: We support recent orthopedic literature suggesting that outcomes of total ankle arthroplasty performed for moderate varus ankle arthritis show no significant difference to TAA performed for ankle arthritis in neutral alignment. We observed similar outcomes in a limited number of TAAs with preoperative varus deformity exceeding 20 degrees.

Notes:

12:42pm–12:48pm

The Effect of Total Ankle Replacement on Energy Recovery During Walking

Robin M. Queen, PhD
Tawnee L. Sparling, BS
Abigail L. Carpenter, MS
Robert J. Butler, DPT, PhD
Daniel Schmitt, PhD

Introduction: Following total ankle replacement (TAR) significant improvements exist in patient-reported and physical performance measures, with limited changes in ankle mechanics. During walking, the muscular effort to accelerate and decelerate the center of mass (COM) can be reduced by converting gravitational potential energy (PE) associated with vertical displacement into forward kinetic energy (KE). The purpose of this study was to determine whether energy recovery is limited in people with ankle osteoarthritis (OA), and to determine if TAR would improve energy recovery 1 and 2-years following surgery.

Methods: Ground reaction force and walking velocity were collected during level walking for 29 subjects scheduled for TAR and again 1 and 2 years following surgery. The oscillations of KE and PE were calculated from the force plate. Energy recovery is affected by the shape of the energy curves, the difference in amplitude between the KE and PE oscillations, and the degree to which PE and KE peaks are out of phase (percentage congruity). An ANCOVA controlling for walking speed was used to examine energy recovery parameters across time.

Results: Walking speed improved significantly from pre-op through both post-op time points. While pre-surgical recovery was low, no differences exist in energy recovery across time when speed is controlled. In addition, percentage congruity change in COM vertical displacement was not significantly different across the three time points.

Discussion: The low recovery pre-op may be explained by walking speed and changes in congruity associated with longer double-support. Alterations in the push-off mechanics at the end of the stance phase is likely associated with limitations in ankle plantar flexion range of motion. Despite improvements in velocity as a result of TAR, the lack of change in energy recovery suggests that pain relief alone is not enough to restore all aspects of normal gait.

Notes:

12:48pm–12:54pm

SOA Resident Travel Grant Award

Deltoid Ligament Repair vs. Syndesmotic Fixation in Bimalleolar Equivalent Ankle Fractures

Christopher R. Jones, MD
James A. Nunley II, MD

Introduction: Bimalleolar equivalent ankle injuries with fracture of the lateral malleolus and a tear of the deep deltoid ligament are an indication for operative intervention. The ideal

operation to restore ankle stability has not been established. Some surgeons advocate performing open reduction with internal fixation of the lateral malleolus with supplemental syndesmotic fixation. Others directly address the pathology of the injury by reducing and internally fixing the lateral malleolus in conjunction with deep deltoid ligament repair. This is the first study (to our knowledge) to compare the outcomes of these two modes of fixation.

Methods: Twenty-seven total subjects who met study criteria were analyzed. Only subjects with an isolated lateral malleolus injury in conjunction with medial clear space widening and no evidence of medial malleolus fracture were eligible for enrollment. Patients with posterior or medial malleoli fractures, age <18, and non-English speaking were excluded. Outcome questionnaires were collected from enrolled patients. The questionnaires included the Lower Extremity Function Scale, Foot and Ankle Disability Index, Short Musculoskeletal Function Assessment, Foot and Ankle Outcome Score, AOFAS Ankle-Hindfoot Scale, VAS and overall function of lower extremity. Fifteen of the patients were treated with open reduction/internal fixation of the lateral malleolus plate and syndesmotic fixation whereas twelve patients were treated with open reduction/internal fixation of the lateral malleolus plate and deep deltoid ligament repair.

Results: Univariate analysis of the outcome questionnaire variables demonstrated no statistically significant differences between the two groups. All patients in the syndesmotic fixation group underwent a subsequent operation for removal of syndesmotic hardware. Additionally, there were two complications in the syndesmotic group that required repeat operative intervention.

Discussion and Conclusion: Repairing the deltoid at the time of lateral malleolus fixation demonstrates subjective, functional and radiological outcomes that are comparable to lateral malleolus fixation with syndesmotic fixation for bimalleolar equivalent ankle fractures. The former avoids the costs and inherit surgical risks that occur during a subsequent operation for removal of syndesmotic hardware.

Notes:

12:54pm–1:00pm

Trends and Demographics in Ankle Arthroscopy in the United States

Jonathan A. Godin, MD, MBA
R. Andrew Henderson, MD, MSc
Benjamin D. Streufert, BS
Selene Parekh, MD, MBA
Samuel B. Adams Jr., MD

Introduction: The purpose of this study was to evaluate the trends and demographics of patients undergoing ankle arthroscopy in the United States.

Methods: Patients who underwent ankle arthroscopy from 2007 to 2011 were identified by searching Current Procedural Terminology (CPT) codes in a national database of 30 million orthopaedic patient records.

Results: In total, 19,298 cases of ankle arthroscopy were identified between 2007 and 2011. The incidence of procedures increased from 6.08 cases per 10,000 patients in 2007 to 6.30 in 2011. Ankle arthroscopy was performed most commonly in patients aged 15 to 19 years, with an incidence of 0.72 cases per 10,000 patients in this age group. There was a female-to-male ratio of 0.59. The greatest incidence was observed in the Western region with an incidence of 0.67 cases identified compared with 0.57, 0.53, and 0.42 in the Midwest, South, and Northeast, respectively. With an incidence of 2.49 per 10,000 patients, CPT code 29898 (ankle debridement, extensive) was the most frequent code used. Annually, an average of 2,244 patients were treated in an outpatient hospital setting, while an average of 1,488 patients were treated at an ambulatory surgery center. Average physician charges were highest for procedures performed in an inpatient hospital setting ($2,274) and lowest for those performed at an ambulatory surgery center ($1,988). Osteochondritis dissecans was the most common underlying primary diagnosis (19.3% of cases).

Discussion and Conclusion: A 7% increase in the rate of ankle arthroscopy was observed in the examined cohort of patients between 2007 and 2011. The most common age group at the time of surgery was patients 15 to 19 years, with a slight female gender predilection. The Western region of the United States was found to have a higher incidence of ankle arthroscopy compared with the Midwest, South, and Northeast. Ankle arthroscopy was most commonly performed in an outpatient hospital setting, while ambula-

tory surgery centers yielded the lowest average physician charges.

Notes:

1:00pm–1:06pm

Distribution of Subchondral Bone Strength in the Talus and Tibial Plafond: A Biomechanical Study

Slif D. Ulrich, MD
Brent G. Parks, MSc
Michael A. Tsai, BS
Stuart D. Miller, MD

Introduction: It is not known why osteochondral defects tend to occur on the posterior talus dome. We hypothesized that subchondral bone strength varies significantly based on location on the talus and tibial plafond.

Methods: Twelve cadaver specimens (age 48 ± 6) of the talus and tibial plafond were used to determine the puncture strength of the subchondral bone. Puncture tests were performed in nine assigned zones on the articular surface in based on a grid of sections measuring 3 x 3 mm. Zone 1 was the most anterior medial and zone 9 was the most posterior lateral. Compressive load was applied through a standard microfracture awl at 2 mm/min, and load/deflection data were collected continuously at 30 Hz. Puncture strength was defined as the first drop in load viewed on the load-deflection curves. One-way ANOVA was used to analyze the data.

Results: The average talus diameter was anterior-posterior, 30.3 ± 4.1 mm, and medial-lateral, 26.2 ± 2.5 mm. Zone 1, the extreme anterior-medial zone, had significantly greater strength than Zones 7 and 9, the extreme posterior medial and lateral zones (215 ± 91 N versus 104 ± 43 N and 102 ± 35 N, respectively; P=<.001). The average tibial plafond diameter was anterior-posterior, 25.8 ± 2.4 mm, and medial-lateral, 23.7 ± 2.1 mm. Zone 3, the extreme anterior-lateral zone, had significantly greater strength than Zone 8, the extreme posterior medial zone (202 ± 72 N versus 112 ± 64 N, respectively; P=<.001). No other significant differences were observed.

Conclusion: These results suggest that the bone is weaker in the posterior region than in the anterior region of the talar dome and tibial plafond. These findings may partly explain the clinical observation of more frequent posterior versus anterior osteochondral lesions. The data also suggest that variations in bone strength occur in normal ankle joint mechanics. Arthroscopic microfracture probes and to

Notes:

1:06pm–1:12pm

The Effect of Retrograde Reaming for Tibiotalocalcaneal Arthrodesis on Subtalar Joint Destruction: A Cadaveric Study

Jason A. Lowe, MD
*Paul C. Buzhardt, MD
Lucas K. Routh, MD
Jeffrey T. Leary, MD

Background: Tibiotalocalcaneal arthodesis using retrograde nail is a proven method of fusing both the ankle and subtalar joint. Mader et al. showed suscessful fusion of both subtalar and ankle joint with only debridement of the ankle joint. To our knowledge, no studies have shown the amount of joint damage to the subtalar joint with retrograde reaming. We hypothesized that the reamer will damage greater than 50% of the posterior facet.

Methods: Bilateral lower extremities of five cadavers were obtained and the subtalar joint was exposed. TTC nail guidewires were inserted and a 12 mm reamer was passed through the ankle joint. Pre and post reaming images of the subtalar joint were obtained to compare joint destruction by the reamer.

Results: The average surface area of the talar posterior and medial facet was 5.87 cm2. This was decreased by 0.321 cm2 for an average of 5.89% of the joint damaged. The average surface area of the posterior and medial facet of the calcaneus was 5.57 cm2. After reamer insertion, this was decreased by 0.218 cm2for an average of 4.01% joint destruction.

Discussion and Conclusion: TTC nail is a successful method of fusion of the ankle and subtalar joint that can be employed using minimally invasive techniques. Mader et al showed successful subtalar union using TTC nail without debridement of the subtalar joint, further limiting soft tissue injury. TTC nail insertion using a 12 mm reamer debrides 5.89% and 4.01% of the respective talar and calcaneal surfaces of the subtalar joint.

Notes:

Friday, July 18, 2014

Concurrent Session 8B: The Geriatric Patient
(Heritage Hall)

Moderator: Valerae O. Lewis, MD

12:30pm–12:36pm

SOA/OREF Resident Award

Decreasing Incidence of Hip Fracture in the US Medicare Population, 2005-2011

R. Andrew Henderson, MD, MSc
Jonathan A. Godin, MD, MBA
Benjamin D. Streufert, BS
Richard C. Mather III, MD
Robert D. Zura, MD

Introduction: Hip fracture represents a major source of morbidity and mortality among the US elderly population. Though the incidence and absolute number of patients sustaining hip fractures has increased over the last half century, studies in the early 2000's suggested the rate of increase in fracture incidence may be slowing or potentially declining. It is unknown if the rate of in-hospital mortality associated with hip fracture has changed over time.

Methods: US Medicare enrollees who were diagnosed with a proximal femur fracture between 2005 and 2011 were identified by searching International Classification of Diseases, 9th Edition (ICD-9) codes in a comprehensive Medicare database with 100% of Medicare inpatient records. Fractures were stratified according to patient demographics, fracture type, comorbid medical conditions, in-hospital mortality, and charges submitted by the admitting facility.

Results: In sum, over 1 million hip fractures were captured in this dataset between 2005 and 2011. The absolute number of hip fractures reported among Medicare patients fell during this period, from approximately 179,000 (or 42.1 per 10,000 person-years) in 2005 to 156,000 (or 32.1 per 10,000 person years) in 2011. There was a 10-fold increase in risk of hip fracture among patients greater than 84 years of age (147.8 per 10,000 person-years in 2005) when compared to patients between 65 and 74 years of age (13.5 per 10,000 person-years). Both decreased over time. Regional variance and association with medical comorbidity was noted. Documented in-hospital mortality fell from 3.2% in 2005 to 2.7% in 2011.

Discussion and Conclusion: The rate of hip fracture in the Medicare population, as well as the risk of in-hospital mortality, is declining. The etiologies for these trends are likely multifactorial, but have significant implications for US population health and US health system economics.

Notes:

12:36pm–12:42pm

Is the Treatment Practice for Femoral Neck Fractures in Medicare Patients Changing in the United States?

Tyler S. Watters, MD
Jonathan A. Godin, MD, MBA
R. Andrew Henderson, MD, MSc
Benjamin D. Streufert, BS
Samuel S. Wellman, MD
David E. Attarian, MD, FACS
Robert D. Zura, MD
Michael P. Bolognesi, MD

Introduction: Femoral neck fractures occur commonly in the elderly Medicare population and represent a significant resource burden on the US healthcare system. Recent literature suggests that total hip arthroplasty (THA) for hip fracture results in superior function with lower reoperation rates compared to hemiarthroplasty or internal fixation. Economic analyses have also suggested long term cost-effectiveness of THA, especially in the setting of improved component designs decreasing the historically high risk of dislocation in fracture patients. The purpose of this study was to evaluate the relative incidence of these procedures in the Medicare population over recent years to determine if there has been any shift in practice preferences.

Methods: The Medicare Standard Analytical Files (SAF) were analyzed from 2005 to 2011. Patients were identified by ICD-9 code for femoral neck fracture and CPT codes for internal fixation, unipolar and bipolar hemiartrhoplasty, or THA. The relative percentage of patients treated for femoral neck fracture with each procedure was compared over time.

Results: 51,908 Medicare patients were identified in 2005 code that were treated surgically. Of these patients 15.9% underwent internal fixation, 77.7% underwent hemiarthroplasty, and 6.4% underwent THA. The overall incidence of femoral neck fracture treated surgically in Medicare patients declined over this time period, however the percentages of the different surgical treatments remained relatively unchanged. In 2011, 41,312 patients were identified; 14.0% underwent internal fixation, 77.9% underwent hemiarthroplasty, and 8.1% underwent THA.

Discussion and Conclusion: The findings of this study suggest that, in the US Medicare population, the surgical treatment practice for femoral neck fractures has remained relatively unchanged, with the overwhelming majority of patients undergoing hemiarthroplasty. Many hip fracture patients may not be ideal candidates for THA for reasons such as cognitive impairment or poor baseline ambulatory function. Nonetheless, these findings suggest that little change in practice preferences has been employed over the last seven years in the US Medicare population despite the recent growing body of evidence to suggest superior functional outcomes, durability, and economic benefits of THA for hip fracture.

Notes:

12:42pm–12:48pm

Repair of Intertrochanteric Hip Fracture: Cephalomedullary Nail Predominates Over Dynamic Hip Screw

Benjamin D. Streufert, BS
R. Andrew Henderson, MD, MSc
Jonathan A. Godin, MD, MBA
Richard C. Mather III, MD
Robert D. Zura, MD

Introduction: Intertrochanteric fracture is a common type of hip fracture that contributes significant morbidity and mortality in the Medicare population. The choice of dynamic hip screw versus cephalomedullary nail for intertrochanteric hip fracture has been debated in the literature, with evidence suggesting superior outcomes with a dynamic hip screw for most fracture patterns. Nevertheless, in recent years, use of cephalomedullary nail has been increasing versus a decline in use of the dynamic hip screw.

Methods: The Medicare 5% Patient Sample database was analyzed from 2005 to 2011. Patients were identified by ICD-9 codes for intertrochanteric femur fracture and by CPT codes for cephalomedullary nail or dynamic hip screw placement. Rates of nail versus plate fixation were examined relative to each other and stratified based on demographics and charges and reimbursements for the admitting facility.

Results: Between 2005 and 2011 in this 5% Medicare sample, 6,808 dynamic hip screw and 11,978 cephalomedullary nail procedures were performed for intertrochanteric fractures. The rates of nail fixation have increased from 1,100 in 2005 to 2,409 in 2011, while rates of plate fixation decreased from 1,517 in 2005 to 667 in 2011. Nail fixation as a proportion treated with either nail or plate fixation rose from 42% in 2005 to 78% in 2011. Patients in all age groups and regions of the US underwent nail fixation in increasing numbers. Average physician charges for plate and nail fixation rose from 2005 to 2011 while average Medicare reimbursements decreased for both procedures over the same period.

Discussion and Conclusion: Cephalomedullary nail is increasingly chosen over dynamic hip screw for intertrochanteric hip fracture. With a questionable evidence basis for the use of nail over plate fixation, this trend has wide-ranging impact on the healthcare of the aging US population.

Notes:

12:48pm–12:54pm

Length-Stable Fixation of Femoral Neck Fractures with Fully Threaded Screws, Does It Work?

Adam A. Sassoon, MD, MS
*Casey deDeugd, MD
Joshua Langford, MD
Kenneth Koval, MD
George Haidukewych, MD

Purpose: An alternate technique of femoral neck fracture fixation with cannulated screws has emerged that utilizes a combination of both partially and fully threaded implants; the rationale for this combination being that once intra-operative compression at the fracture site is achieved initially with partially threaded screws, additional fully threaded screws will provide length-stable fixation and prevent collapse through zones of comminution. This study investigates the clinical efficacy of this "length-stable" hybrid fixation construct compared to traditional methods using only partially threaded screws for compression.

Methods: Following IRB approval, patients undergoing cannulated screw fixation for femoral neck fractures between 2008 and 2012 were identified using our trauma registry. Patients were followed until bony-union, failure, death, or for a minimum of 3 months. Patient age, gender, tobacco use, BMI, and medical co-morbidities were noted. Injury related variables including, mechanism, Garden classification, Pauwels angle, and associated injuries were recorded. Finally, treatment related factors including time until surgical treatment, the need for open reduction, fixation construct, and reduction quality were assessed. Univarite analysis using a Cox proportional hazard model was used to determine relative risk of fixation type with the need for revision. Univariate logistical regression was used to determine an association between fixation type and post-operative pain and ambulation status as well.

Results: Two hundred and sixty-five femoral neck fractures were treated at our institution between 2008-2012. Of these, 72 were treated with cannulated screws in patients with a mean age of 65 (range 18-91). In 55 instances only partially threaded screws were employed, while 17 utilized a "length-stable" construct, using a combination of partially and fully threaded screws. Twenty-one patients in the partially threaded group and 4 patients in the "length-stable" group were lost to follow-up, leaving 34 and 13 patients in each group, respectively, available for further retrospective review. Four patients (12%) in the partially threaded group developed a failure requiring revision to a total hip arthroplasty in 3 and a revision of fixation in 1. Five patients (38%) in the "length-stable" group developed a mechanical failure, all of whom required conversion to a total hip arthroplasty. Length-stable fixation was associated with a 4-fold risk of revision when compared to standard fixation ($p=0.04$). Length-stable fixation was also associated with increased post-operative pain ($p=0.001$) and a need for ambulatory assistance ($p<0.001$).

Conclusion: The addition of fully threaded screws to achieve a "length-stable" construct for the fixation of femoral neck fractures led to a significantly increased risk for revision when compared to traditional cannulated screw constructs. We have abandoned this technique based on this data.

Notes:

12:54pm–1:00pm

Intramedullary Nailing of Femoral Diaphyseal Metastases: Is It Really Necessary to Protect the Femoral Neck?

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

Introduction: Intramedullary nailing is the accepted form of treatment for impending or pathologic fractures of the femoral diaphysis. Traditional teaching promotes the use of a cepahlomedullary nail so that stabilization is provided for the femoral neck in the event that a future femoral neck metastasis develops. However, there is no evidence in the literature that supports this practice. The purpose of this study is to evaluate the incidence of femoral neck metastases in patients who underwent femoral nailing of diaphyseal metastases.

Methods: Retrospective analysis of our Musculoskeletal Oncology database identified 146 femoral nailings performed for metastatic disease, myeloma, or lymphoma of the femoral diaphysis between 2001 and 2011. Average age was 59 years old. 145 of the nails were cephalomedullary implants and 1 was flexible nails. 84 cases received either preoperative or postoperative radiation therapy.

Results: Average radiographic follow-up was 13 months and average postoperative survival was 14 months. No (0%) cases of femoral neck metastases developed postoperatively.

Conclusion: Despite traditional teaching, that supports the use of cephalomedullary implants when treating metastatic disease of the femur, we were unable to identify a single case of femoral neck metastases developing after surgery. Our findings do not support the ubiquitous use of cephalomedullary implants in this patient population for the sole purpose of prophylactic femoral neck stabilization.

Notes:

1:00pm–1:06pm

Role of Advanced Imaging in Evaluation of Post-Operative Delirium After Total Joint Arthroplasty

Bryce C. Allen, MD
John Reilly, BS

Introduction: Delirium may occur 5 – 10% of the time after major elective orthopaedic surgery. Diagnostic work-up often includes advanced imaging of the brain to evaluate for structural or cerebrovascular causes of altered mental status. It is unclear how often these studies lead to a definitive diagnosis, or what risk factors may lead to increased risk of abnormal studies.

Methods: A retrospective review was performed of patients admitted for inpatient orthopedic surgery with subsequent advanced imaging of the brain. Cases were reviewed for associated symptoms (including the presence of focal neurological symptoms), positive findings on advanced imaging, diagnosis relating to altered mental status, interventions initiated based on the diagnosis, and adverse outcomes relating to altered mental status.

Results: 48 patients met inclusion criteria. 10 had focal findings on exam. 25 (52%) had chronic changes on advanced imaging and 2 patients had acute changes, both of whom had focal findings on exam. 3 patients had a final neurologic diagnosis, all having focal findings on physical exam.

Discussion and Conclusion: Focal findings on exam is sensitive for presence of positive findings on advanced imaging. Advanced imaging in the absence of focal findings on exam may be unnecessary in the evaluation of delirium after major orthopedic surgery.

Notes:

1:06pm–1:12pm

Sex and Quality of Life in Patients Undergoing THA

Jesus M. Villa, MD
Carlos J. Lavernia, MD, FAAOS
David A. Iacobelli, MD

Introduction: Being active sexually has been associated with a high quality of life (QoL). Hip arthritis significantly affects the ability of patients to have sex. Our objectives were to study the relationships between limitations in sexual activity due to hip arthritis and QoL and to determine the postoperative effects of THA on both.

Methods: 159 consecutive patients who underwent unilateral primary THA due to osteoarthritis were studied. We divided them into two groups (with or without sexual limitations). Patient characteristics evaluated included age, gender, race, ethnicity, marital status, education level, and religion. Preoperative and postoperative Pain intensity/frequency VAS, QWB-7, SF-36, WOMAC, Harris and Merle-D'Aubigné-Postel scores were compared between groups after adjustments. Mean age was 65 years (45% females). Chi-Square, t-tests, and multivariate analysis of covariance (MANCOVA) were used.

Results: Hip arthritis caused a significant interference in the sexual life of 82% of patients in this series. 96% of females reported limitations while only 72% of males did. Preoperatively, patients with limitations had a mean pain intensity (VAS) of 8 while patients without limitations had 6. The same pattern was observed regarding the frequency of pain (8 vs. 6, respectively). The QWB-7 Total (0.522 vs. 0.569), SF-36 physical function (19 vs. 44), SF-36 social function (44 vs. 67), SF-36 physical component summary (27 vs. 35), WOMAC total (54 vs. 37), Harris (47 vs. 63) and Merle-D'Aubigné-Postel (11.1 vs. 13.5) scores were significantly different. Postoperatively, all significant differences disappeared with the exception of the SF-36 physical function scores (51 vs. 67).

Discussion and Conclusion: Our data suggests that the hip plays a key role in the sex lives of patients. Sexual activity seems to be a key component of the overall QoL among patients undergoing total hip arthroplasty. Any limitation in sexual activity due to hip arthritis should be seriously considered as a prime indication for THA.

Notes:

1:12pm–1:18pm

The Radiographic Prevalence of Femoral Acetabular Impingement in Patients Undergoing Total Hip Arthroplasty at a Tertiary Referral Center

Kyle E. Fleck, MD
Kris Wheeler, MD
Edmund Z. Brinkis, MD

Introduction: Since Ganz et al. coined the term "femoroacetabular impingement" and explained the mechanism by which these subtle deformities can adversely affect the hip joint, increasing evidence has emerged that supports femoroacetabular impingement as a major cause of osteoarthritis of the hip in young adults. A review of the literature reveals no studies looking at the prevalence of FAI in patients that have undergone total hip arthroplasty. Our hypothesis is that there will be a high prevalence of patients with previously undiagnosed femoroacetabular impingement undergoing total hip arthroplasty.

Methods: We evaluated the prevalence of FAI in patients that had a primary total hip arthroplasty performed at our institution beginning January 1, 2010, thru December 31, 2012, by inspecting the patient's preoperative radiographs for signs of pincer or cam impingement. Pincer impingement was diagnosed by evidence of acetabular retroversion or by evidence of global acetabular over coverage. Cam impingement was diagnosed with an alpha angle greater than 50.5° on the AP pelvis or lateral hip radiograph.

Results: The study consisted of 116 right hips and 124 left hips to evaluate for cam and pincer impingement. The mean alpha angle on the right was 71.4° (range: 32.6-103°) and 71.2° (range: 24.5-118°) on the left. An alpha angle greater than 50.5° was found on 91.3% right hips and 85.4% left hips. Evidence of pincer impingement was found in 89% of the patients with at least one positive sign and 45% of patients

had at least four positive signs. Coxa Profunda was the most common sign of pincer impingement with 63% and 64% of the right and left hips being positive, respectively. 98% of the patients had at least one positive radiographic finding of either cam or pincer impingement.

Conclusion: A large number of patients undergoing total hip arthroplasty at our institution had previously undiagnosed femoroacetabular impingement giving further evidence that this process is a major cause of hip arthritis.

Notes:

2014 Scientific Program Abstracts — Saturday McCoy's Peak Room Gerald Ford Hall

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

Saturday, July 19, 2014

General Session 9: Arthroplasty II — Knee

Moderator: Shawn B. Hocker, MD

6:35am–6:41am

Extreme Variability in Posterior Slope of Proximal Tibia: Are We Accounting for Patients' Normal Anatomy in UKA?

C. Lowry Barnes, MD
Ryan M. Nunley, MD
Cara Petrus, MHA

Introduction: Unicompartmental knee arthroplasty (UKA) is becoming more common and is more technically challenging than total knee replacement. Retention of the anterior and posterior cruciate ligaments requires more accurate recreation of the patient's normal anatomic posterior slope with UKA. Therefore, the purpose of this study was to accurately determine the posterior tibial slope in patients undergoing a medial or lateral UKA.

Methods: A retrospective review was completed for 2,395 CT scans (2,031 medial and 364 lateral UKA) performed for a customized UKA implant. Standard CT technique was used and the posterior slope was measured on the involved side of the proximal tibia.

Results: CT measurements from the 2031 medial UKAs had an average pre-operative posterior slope of 6.8± 3.3 deg., In these patients, the posterior slope was between: 0–4 deg in 21.2% (430 knees), 4–7 deg in 34.3% (696 knees), 7–10 deg in 26.8% (545 knees), >10 deg in 17.7% (360 knees), and 0.6% (13 knees) had a reversed (anterior) tibial slope. Measurements from the 364 lateral UKA knees showed an average pre-operative posterior slope of 8.0±3.3 deg . In these patients, the posterior slope was between: 0–4 deg in 11.8% (43 knees), 4–7 deg in 27.5% (100 knees), 7–10 deg in 32.4% (118 knees), >10 deg in 28.3% (103 knees), and 0.3% (1 knee) had a reversed (anterior) tibial slope.

Conclusion: There is marked variability in the posterior slope of the proximal tibia with 44.5% of medial plateaus and 60.7% of lateral plateaus having more than 7 deg of posterior slope pre-operatively. If attempting to match the patient's proximal slope during UKA, a routine 5 degree posterior slope setting will produce a posterior slope that is less than the patient's native anatomy for more than 50% of patients.

Notes:

6:41am–6:47am

The Impact of Patient Specific Guides and Mechanical and Kinematic Alignment on Patient Satisfaction and Function After TKA

Ryan M. Nunley, MD
Denis Nam, MD
Adolph V. Lombardi Jr., MD
Stephen M. Howell, MD
Robert L. Barrack, MD

Introduction: Several studies have examined the ability of Custom Cutting Guides (CCG) to avoid outliers and achieve certain alignment targets, but few studies have evaluated the

impact of CCG on patient satisfaction and function following total knee arthroplasty (TKA).

Methods: One center performed TKA targeting neutral mechanical axis (MA) with CCG and standard instrumentation. A second center used CCG to approximate pre-arthritic knee alignment (kinematic axis; KA). Both centers used the same cemented cruciate-retaining implant, with patella resurfacing. Patients were evaluated by an independent, third party survey center with expertise in administering medical outcomes questionnaires for federal agencies. Interviewers were blinded to treatment group and administered questionnaires determining satisfaction, residual symptoms/function, and pre-arthritic and post-operative activity level utilizing previously published survey instruments.

Results: 234 MA TKA patients were interviewed; 59 CCG, 175 standard instrumentation. CCG patients had higher premorbid UCLA Scores (7.5 vs 6.9), but post-op scores were virtually identical (6.6 vs. 6.7). No differences approached significance for satisfaction or residual symptoms, so the two groups of MA TKA were combined for comparison with KA TKA. 89 KA TKA with CCG patients were interviewed. Compared to the 234 MA TKAs, the pre-morbid and post-operative UCLA scores were identical (7.0 and 6.7 for both). More KA TKAs were satisfied with degree of pain relief (99% vs 95% for MA TKA) and trended towards significance for function (knee feels normal, 90% vs 82% for MA TKA). In terms of satisfaction and residual symptoms, fewer KA TKAs had problems getting in/out of a chair (16% vs 27% for MA TKA).

Conclusion: CCG with MA TKA was associated with no difference in patient satisfaction or residual symptoms compared to MA TKA with standard instrumentation. CCG with KA TKA, however, had higher satisfaction than MA TKA and warrants further study.

Notes:

6:47am–6:53am

Irrigation and Implant Retention in Acute Knee PJI: Does It Work?

David A. Iacobelli, MD
Carlos J. Lavernia, MD, FAAOS
Jesus M. Villa, MD

Introduction: Irrigation and debridement (I&D) with liner exchange and implant retention have been recently associated with very poor outcomes. We studied a case-series of acute periprosthetic joint infections treated with aggressive I&D with polyethylene liner exchange and component retention and evaluated: 1.- infection control rate; 2.- preoperative characteristics; 3.- pain and function of patients in whom treatment was successful; and 4.- outcomes of failed cases.

Methods: We retrospectively studied 28 patients who underwent I&D by a single surgeon. Mean age was 67 years (range, 32–87). Patient perceived outcomes and clinical knee scores were assessed postoperatively. We defined a successful case as one with decreased symptoms (i.e. pain relief) and improved function regardless of the need for additional I&D or the use of oral suppressive antibiotics. A failed case was defined as one that needed prosthesis resection or a symptomatic one with low functional levels. The mean follow-up after a successful I&D was 4 years (range, 20–104 months). Two patients were lost to follow-up.

Results: Overall, 18 patients (64%) were successfully treated with aggressive I&D. Additional I&Ds (mean, 1.4; range, 1–2) were required in 5 of them. Among patients successfully treated, all outcomes improved postoperatively at the latest follow-up. Six additional patients underwent prosthesis resection and reimplantation due to persistent pain and/or functional impairment; among them, four (67%) had a successful outcome after the two-stage procedure. The remaining other four patients had a poor outcome.

Discussion and Conclusion: Aggressive I&D with liner exchange and implant retention is a reasonable treatment option for acute periprosthetic total knee infections particularly in the face of shared decision making. It can yield significant pain relief and acceptable functional outcomes. Treatment algorithm of PJI should take into account patient preferences.

Notes:

6:53am–6:59am

Potential Benefits of Using Liposomal Bupivacaine Instead of Epidurals in Total Knee Arthroplasty

Eric A. Heim, MD
Marty K. Bushmiaer, APRN
Robin M. Queen, PhD
Robert J. Butler, DPT, PhD
George W. Byram III, MD

Introduction: Pain control and improving early post-operative function are important following total knee replacement (TKA). The purpose of this study was to evaluate differences in post-operative pain, rescue opiate medication use, and length of hospital stay when using two different pain control strategies, local liposomal bupivacaine (LB) injection and epidural, following TKA.

Methods: A retrospective review of 25 consecutive patients receiving LB and 25 consecutive patients receiving an epidural was completed. Pain scores during the first 24 hours, post-anesthesia care unit (PACU) times, lengths of hospital stay, as well as range of motion (ROM) and ambulation distance were recorded. Statistical comparisons between the two groups were completed using a t-test (α=0.05).

Results: LB and epidural patients had statistically similar sum pain scores for the first 24hrs: 13.6 and 10.4 points, respectively. Patients in the LB group required 13.4 mg of rescue opiates through POD 1 compared to 18.4 mg in the epidural group. Average PACU times for the LB and epidural groups were 45.3 min and 50.6 min respectfully. Length of hospital stay differed significantly with an average of 1.04 nights in the LB group and 2.00 nights in the epidural group. PT results demonstrated significant improvements in ROM on POD 1 (LB: 92.2 degrees; Epidural: 80.5 degrees). The LB group walked 132.4 feet, compared to 94.4 feet for the epidural group.

Conclusion: In our patient population the subjective sum pain scores were equivocal, but there were less frequent complaints of pain in the LB group. A decrease in hospital stay, improved ROM and ambulation distance in patients treated with local injection of LB when compared to patients who received epidurals for TKA. LB appears to provide effective pain control allowing sooner accurate titration of oral narcotics leading to shorter hospital stays and improved early physical therapy results.

Notes:

6:59am–7:05am

Vitamin D Deficiency in Total Knee Replacement Surgery

Jesus M. Villa, MD
Carlos J. Lavernia, MD, FAAOS
David A. Iacobelli, MD

Introduction: Our main objective was to investigate the relationships between preoperative Vitamin D (Vit-D) levels and outcomes in patients with end-stage osteoarthritis who underwent primary TKR and to determine the effects of Vit-D supplementation on postoperative outcomes among patients with deficiency.

Methods: We studied 180 consecutive patients (196 cases) and divided them into two groups (normal or deficient) based on preoperative plasma 25-hydroxyvitamin-D3 levels (≤ 20 ng/mL defined deficiency). Demographics and preoperative ASA, Charlson, BMI, Albumin, Transferrin, Calcium, Total Lymphocyte Count (TLC); preoperative and postoperative QWB-7, SF-36, WOMAC, Knee Society (KS) and Hospital for Special Surgery (HSS) knee scores were compared between groups. Based on internist preferences, some of the patients with deficiency had Vit-D supplementation ordered while in the hospital. Chi square and t-tests were used.

Results: Prevalence of Vit-D deficiency was 22%. The remaining preoperative laboratory values were not different between groups. Patients with deficiency had higher BMI (31.8+/-S.E. 0.83) compared to patients with normal levels (29.9+/-0.42); 26% of females had deficiency before surgery in contrast to 12% of males. Those with deficiency had significantly worse mean pre-operative WOMAC function (40.1+/-0.78 vs. 44.4+/-1.34), WOMAC total (53.8+/-1.05 vs. 59.7+/-1.80), SF-36 function (11.6+/-1.18 vs. 4.8+/-1.34), and SF-36 physical component summary scores (22.7+/-0.42 vs. 20.4+/-0.56). Postoperatively, patients with normal levels

had better SF-36 mental health scores (74.1+/-0.97 vs. 69.6+/-2.46). There were no significant differences in postoperative outcomes between those patients who had supplementation.

Discussion and Conclusion: Vit-D deficiency is fairly prevalent among patients who undergo TKR. Obese and females had significantly higher deficiency rates. Patients with deficiency underwent surgery with worse preoperative patient perceived outcomes. Even though we did not find significant differences regarding postoperative supplementation, this is safe, inexpensive, and it could positively affect outcomes.

Notes:

7:05am–7:11am

Patient Satisfaction and Residual Symptoms Following TKR and PKR: What Do the Patients Say When We Aren't Around?

Ryan M. Nunley, MD
Michael E. Berend, MD
Robert L. Barrack, MD
Keith R. Berend, MD
Adolph V. Lombardi Jr., MD
Craig J. Della Valle, MD

Introduction: Limited data exists comparing functional results of partial and total knee replacement. This study compared functional results, residual symptoms, and patient satisfaction between total knee replacement (TKR), fixed bearing partial knee replacement (FB-PKR), and mobile bearing partial knee replacement (MB-PKR).

Methods: A multicenter study surveyed 1,263 patients (age 18-75) undergoing primary TKR and PKR for non-inflammatory DJD. An independent third party with expertise in collecting healthcare data for state and federal agencies collected data. We examined 13 questions regarding pain, satisfaction, and residual symptoms. Multivariate analysis was conducted, significance set at p0.8 was achieved. We controlled for gender, age, income, minority status, and surgical location.

Results: Univariate analysis revealed PKR patients were more likely to be younger, male, and have income > $25,000/yr than TKR patients. Multivariate analysis showed MB-PKRs were 1.81 times more likely to report their operative knee felt "normal" and 2.69 times more likely to report satisfaction with ability to perform activities of daily living (ADL) than TKRs. MB-PKRs were 44% less likely to report grinding/popping/clicking, 39% less likely to report swelling, and 40% less likely to report stiffness in the last 30 days compared to TKRs. FB-PKR patients were 51% less likely to experience problems getting in/out of a car than TKR patients. FB-PKRs were 60% less likely to be satisfied with the degree of pain relief than TKRs. Remaining questions trended towards advantages for MB-PKR over TKR but were not significant.

Conclusion: Patient satisfaction is higher for MB-PKR than TKR with more patients reporting the knee feels normal and more able to perform ADLs. FB-PKRs reported slightly less pain relief than TKR. MB-PKR had fewer residual symptoms than FB-PKR.

Notes:

7:11am–7:17am

Self-Perceived Severity of Illness and Hospital Expenditures in Arthroplasty

David A. Iacobelli, MD
Carlos J. Lavernia, MD, FAAOS
Jesus M. Villa, MD

Introduction: Health related quality of life instruments have been used to document outcomes in order to optimize the allocation of resources. The purpose of this study was to determine the association of hospital expenditures and preoperative self-rated perceived general health in patients who underwent total hip and knee replacement.

Methods: 763 consecutive TJA (545 knees and 218 hips; 621 patients) performed in a single institution by a single surgeon

were retrospectively studied. Patients were divided in two groups based on the results of a very simple preoperative self-assessment of general health (poor/fair = 167; good/excellent = 236). Hospital costs, Charlson score, ASA, and patient perceived outcomes (QWB-7, WOMAC, and SF-36) were compared between groups. Chi-square and t-tests were used.

Results: Patients with poor or fair general health had significantly higher direct costs ($14,917 vs. $17,060), indirect costs ($5,367 vs. $6,306), and operating costs ($20,285 vs. $23,366) than patients who rated it as good or excellent. Self-perceived poor or fair general health was associated with higher Charlson score (1.83 vs. 1.24) but it was not associated with higher ASA score. Patients in the poor/fair group had significantly worse preoperative QWB-7 total (0.508 vs. 0.537), WOMAC total (60.6 vs. 52.6), and SF-36 physical component (23.5 vs. 27.7).

Discussion and Conclusion: In our study, worse self-perceived "Severity of Illness" was associated with higher resource consumption. Poor or fair self-perceived general health was found to be significantly associated with more hospital expenditures in patients who underwent primary TJA of the knee or hip. Patients own perception of general health is a simple and useful tool that could be used to stratify the outcomes of interventions.

Notes:

7:17am–7:23am

Arthrofibrosis in Primary Total Knee Arthroplasty: The Role of Mental Health

Jesus M. Villa, MD
Carlos J. Lavernia, MD, FAAOS
David A. Iacobelli, MD

Introduction: Psychological distress (PD) has been associated with adverse outcomes following TKA. However, its relationship with arthrofibrosis after TKA remains unclear. Therefore, the purposes of this study were: 1- assess patient perceived outcomes (PPO)/knee scores of those cases who developed arthrofibrosis and required manipulation and those that didn't; 2- in cases with arthrofibrosis, determine outcomes of those with PD and those without it; 3- assess associations between PD and arthrofibrosis after primary TKA.

Methods: We retrospectively reviewed 1,503 consecutive primary TKAs (1,187 patients) performed over a period of 14 years. Among them, 57 cases (53 patients) developed arthrofibrosis and underwent manipulation under anesthesia after the index procedure. This group was compared to a matched group (by age, gender, race, and ethnicity) of 63 knees (58 patients) without arthrofibrosis. Demographics, pre-operative and postoperative QWB-7, SF-36, WOMAC, Hospital for Special Surgery (HSS) knee score, Knee Society (KS) knee and function scores, Knee-active-flexion (KAF), and KS-range-of-motion (ROM) were analyzed. Patients with less than 52 points on the SF-36 mental-component-summary subscale were considered to have PD for all comparisons. Minimum follow-up was 2 years.

Results: Preoperatively, the mean KS function (27) of the arthrofibrosis group was significantly worse compared to the one (37) of the control. Postoperatively, the HSS, KS function, WOMAC stiffness/total scores, KAF, and KS-ROM were significantly worse. Preoperatively, cases with arthrofibrosis and PD had significantly worse QWB-7, KS function, WOMAC stiffness and total scores than those without distress. There was no association between PD and arthrofibrosis.

Discussion and Conclusion: Patients who developed arthrofibrosis had worse preoperative KS function and worse postoperative PPO, knee scores, and ROM measures than patients who didn't develop it. Patients with arthrofibrosis and PD perceived themselves preoperatively with worse quality-of-well-being, poorer function, and more stiffness. We did not find significant associations between PD and arthrofibrosis after TKA.

Notes:

Saturday, July 19, 2014

General Session 10: Arthroplasty III — Hip

Moderator: C. Lowry Barnes, MD

7:30am–7:36am

Intra-Operative Imaging Improves Leg Length Correction in Total Hip Arthroplasty, but Not Offset or Cup Inclination

Daniel R. Nelson, MD
*Andrew A. Shinar, MD
Thomas O'Gorman
Yanna Song, MS

Introduction: Restoration of limb length, offset, and acetabular inclination has been shown to improve gait mechanics and implant wear properties. There is currently no universally accepted method to achieve these goals during total hip arthroplasty (THA). Our aim was to determine if intra-operative radiographs improve the accuracy of leg length, offset and acetabular inclination in THA.

Methods: We performed a retrospective cohort study reviewing the pre-, intra-, and post-operative radiographs of 95 consecutive patients (101 hips) who underwent THA by a single surgeon. Leg length, offset and acetabular inclination were calculated using digital radiographs. The 3 groups consisted of 28 hips with no intra-operative radiographs, 24 hips with intra-operative fluoroscopic radiographs, and 27 hips with intra-operative plain radiographs. Four different surgical approaches were used in the study. Patients who had bilateral hip osteoarthritis, developmental hip dysplasia, or pre-operative leg length discrepancy > 20mm were excluded. The 3 groups were compared using Wilcoxon, Pearson, and Chi-squared tests.

Results: Patients with intra-operative imaging with fluoroscopy or plain film radiography compared to no intra-operative radiography had significantly improved leg length correction (-0.08mm+ 5.5mm vs. 3.46mm+ 5.86mm, P= 0.004), but not acetabular inclination (target range 30-50, 96% vs 100%), or offset (target range +4mm from pre-operative offset, 54% vs. 47%). There was no significant difference between fluoroscopy and plain film radiography for leg length, inclination, or offset. Intra-operative plain x-rays without fluoroscopy significantly improved leg length correction compared to no intra-operative imaging (-0.07+ 6.25 vs. 3.46+ 5.86, P=0.02), but not acetabular inclination (target range 30-50, 96% vs. 100%) or offset (target range +4mm from pre-op offset, 56% vs 50%).

Discussion and Conclusion: Intra-operative radiographs (fluoroscopic or plain film) significantly improve accuracy of leg length correction but not offset restoration or acetabular inclination in total hip arthroplasty.

Notes:

7:36am–7:42am

Fixation, 15-Year Survival and Intraoperative Fracture with Monoblock Full-Coat Femoral Components in Revision Hip Arthroplasty

Paul F. Lachiewicz, MD
Elizabeth S. Soileau, BSN

Introduction: Femoral revision using monoblock full-coat femoral components offers distinct advantages in patients with notable bone loss. There is relatively little data on long-term survival and complications associated with the use of these components.

Methods: This retrospective study of prospectively collected data included 104 consecutive revisions with monoblock full-coat components of two different manufacturers. Data on intraoperative fracture, aseptic loosening and reoperation were analyzed. Ninety-two hips, with a mean follow-up time of 8 years (range, 2-16 years), were evaluated with the Harris hip score and radiographic evidence of loosening. Kaplan-Meier survivorship was calculated to 15 years. Demographic, radiographic, and operative factors associated with implant survival and intraoperative fracture, were analyzed with use of chi-square and Wilcoxon tests.

Results: Nine hips (10%) had femoral component loosening, with 7 hips re-revised or pending, and two with radiographic loosening. With failure defined as femoral component revision for aseptic loosening or radiographic evidence of loosening,

implant survival was 87.5% at 15 years. Those femurs with Paprosky grade 3B and 4 defects had a significantly higher risk of failure (p=0.03). Intraoperative complications in 17 hips (diaphyseal fracture 11, perforation 4, and proximal fracture 2) required allograft strut and cable fixation in 14 hips. Intraoperative fracture was significantly associated with the use of a curved stem. There was a higher rate of intraoperative fracture with one type of monoblock component compared to the other with a modified tip, but this difference was not statistically significant.

Discussion and Conclusion: Monoblock full-coat femoral components have a high rate of fixation and long-term success in revision hip arthroplasty. Hips with Paprosky grade 3B and 4 have a higher risk of failure. Curved stems have a significantly greater chance of intraoperative fracture requiring treatment.

Notes:

7:42am–7:48am

Early Complications of Titanium Modular Neck Total Hip Arthroplasty

R. Andrew Henderson, MD, MSc
*Erika L. Templeton, MD
Paul F. Lachiewicz, MD

Introduction: The use of a modular neck in primary total hip arthroplasty is controversial. The ability to adjust neck length, offset, and version should result in decreased dislocation and leg-length discrepancy by more accurate reproduction of normal hip anatomy. However, these components add the risk of an additional metal-on-metal junction and potential site for mechanical failure.

Methods: One surgeon performed or supervised 96 total hip replacements (90 patients) through the posterior approach utilizing one modular neck ML taper femoral component. The early complications were retrospectively reviewed. 81 hips had minimum follow-up of 6 months (mean 19 months; range 6-48 months). Radiographs were measured for leg length, femoral offset, acetabular component abduction, and early subsidence.

Results: 6 hips (7.4 %) had one or more dislocation (all early) and 1 patient (1.2 %) had subsidence of the femoral component. A total of 9 patients (11.1 %) underwent reoperation – 3 for instability, 5 for infection, 1 for loosening. There was one dissociation of the femoral neck from the stem during a closed reduction, requiring open reduction. Of the 40 possible neck version and offset combinations available, 22 (55%) were utilized in this cohort. Radiographic evaluation revealed that 42 hips (51.8%) were reconstructed to match native leg length within 5 millimeters and 43 (53.0%) matched native offset within 5 millimeters. 23 hips (28.4%) matched both parameters simultaneously for an effectively anatomic reconstruction.

Discussion and Conclusion: There was an unacceptably high rate of dislocation and complications of THA with a modular titanium neck ML taper femoral component at short-term follow-up. There was no apparent benefit of modular neck femoral components and we have abandoned their use.

Notes:

7:48am–7:54am

Chromium and Cobalt Levels and Associated MARS MRI Findings in Previously Unreported Design of Chrome Cobalt Modular Neck

Christopher T. Parks, MD

Purpose: Wright Medical has a long history of modular neck hip implants, but had fracture issues with the original titanium necks. Following these issues, the necks were changed to chrome cobalt modular necks. Direct contact between these dissimilar metal parts in the modular femoral component could cause adverse reaction of metal-on-metal articulations that have been previously described with these implant designs.

Methods: A retrospective review of 10 patients with Wright Medical chrome cobalt modular necks who had completed both a chromium and cobalt metal ion level analysis and a Metal Artifact Reduction Sequence (MARS) MRI. Pseudotumors were classified using MRI based on wall thickness, T1/T2 signal, shape, and location and each pseudotumor was given a corresponding type of I, II, or III. For each patient, the presence or absence of symptoms and the time since surgery were recorded.

Results: Of the 10 patients tested, 9 were symptomatic, and 1 was asymptomatic. The asymptomatic patient was last seen in the clinic 14 months post-op while the symptomatic patients averaged 18 months following surgery before symptoms began. Those with metal-poly articulation had an average cobalt level of 1.6, ceramic-ceramic articulation had a level of <1, and metal-on-metal had a level of 2.9. Five patients had pseudotumor based on MRI (2 type I, 1 type II, and 2 type III).

Conclusion: A potential unintended consequence of changing from titanium to chrome cobalt modular neck may be occurring secondary to corrosion at the neck-stem junction. This reaction does not appear to be design-specific as these findings are similar to previously reported findings in another manufacturers modular-neck hip stems recalled in 2012. Surgeons evaluating patients with these and other similar stems should be aware of this complication and consider ion testing and MARS MRI during post-operative follow-up.

Notes:

7:54am–8:00am

Total Hip Arthroplasty in Patients 21 and Younger Using Highly Cross Linked Polyethylene: Excellent Survivorship at 5 Years

Adam A. Sassoon, MD, MS
Frank C. Bohnenkamp, MD
Geneva Baca
Gail Pashos
John C. Clohisy, MD

Purpose: The survivorship of total hip arthroplasty (THA) in the extremely young has been questioned secondary to the patients' increased expected activity level and duration of need. Despite these concerns, THA often remains the only option for returning a subset of patients to a functional life. Highly cross linked polyethylene (HCLPE) has been touted in the general THA population for outstanding wear rates. This study investigated the mid-term survivorship of THA in very young patients using HCLPE.

Methods: A retrospective review of prospectively collected data was performed using our institution's joint registry. Patients aged 21 and younger who underwent THA between 2000-2009 using HCLPE were identified for inclusion. Patients were followed for a minimum of 2 years or until revision. Survivorship free from revision, Harris Hip Score (HHS), Western Ontario McMaster Universities Osteoarthritis Index (WOMAC), Short Form-12 (SF-12), and UCLA activity score were tabulated.

Results: Fifty-six THA's were performed in 27 females and 16 males with a mean age of 17.5 (11-21) using a HCLPE bearing surface. Mean follow-up was 57 months (24-98). The most common indication for THA was osteonecrosis. All acetabular components were uncemented, 54 femoral components were uncemented, and 2 femoral components were cemented. The overall survivorship free from revision was 98%. One failure occurred secondary to aseptic loosening. The mean HHS increased from 42 to 82, the mean SF-12 physical score increased from 29-45, and the mean UCLA score increased from 3.2 to 6.2. WOMAC pain, stiffness, and function scores all increased as well.

Conclusion: This is the largest clinical series to date, reporting midterm follow-up of uncemented THA in the extremely young, using HCLPE as a bearing surface. The five-year

survivorship, free from revision was 98%. This patient cohort demonstrated significant functional impairment preoperatively and showed improvement pain and function following surgical intervention. Despite these gains, their average postoperative activity level remained moderate, which may partly contribute to increased prosthetic survival. Continued concern for decreased longevity in this patient population is warranted; however, these results are encouraging. Further longitudinal data is needed to determine the long-term survivorship of THA in this cohort.

Notes:

8:00am–8:06am

Pain Patterns in Young, Active Patients Following Hip Arthroplasty

Ryan M. Nunley, MD
Peter J. Brooks, MD
John C. Clohisy, MD
Humaa Nyazee, MPH
Robert L. Barrack, MD

Introduction: The purpose of this study is to determine the incidence, severity, and location of pain experienced by young active patients after hip arthroplasty utilizing pain drawings.

Methods: This multicenter study identified a cohort of young, active patients who were at least one year post SRA or THA. Young active patients were defined as males age 18-60, females age 18-55 with a pre-symptomatic UCLA score ≥ 6. Potential participants were mailed a letter explaining the study and asking them to complete a questionnaire. Participants were asked to indicate whether or not they experienced pain and to what level in 8 anatomical areas of interest. Participants used a 0 – 5 pain scale, with 0 being 'No Pain' and 5 being 'Constant Pain'. Completed questionnaires were returned to their respective centers and de-identified data was sent to the coordinating center. For data analysis purposes, pain was considered to be 'mild' if scored with a 0 or 1 (no pain or pain only with extreme activity). Pain was considered to be 'moderate/severe' if scored between 2 and 5.

Results: Four hundred and thirty-three questionnaires were returned (224 SRA/209 THA) from two centers. Forty percent of patients reported pain in at least one area. There was no difference in groin pain as reported by both SRA and THA patients (SRA=70/224, 31%; THA=61/209, 29%). THA patients reported more anterior thigh pain (SRA=18/224, 8%; THA=53/209, 25%). In addition, anterior thigh pain was more severe for THA patients (Pain >1: SRA=7/224, 3%; THA=31/209, 15%).

Conclusion: Many young, active patients experience some degree of pain after hip replacement when assessed with pain drawings. Patients with SRA and THA are equally likely to experience groin pain. THA patients experience significantly more anterior thigh pain with a surprising number having moderate or worse anterior thigh pain.

Notes:

8:06am–8:12am

Are the Range of Motion Measurements Needed When Calculating the Harris Hip Score?

Paul K. Edwards, MD
Robin M. Queen, PhD
Robert J. Butler, DPT, PhD
Michael P. Bolognesi, MD
C. Lowry Barnes, MD

Introduction: The Harris Hip score (HHS) has been used in many surgical and non-surgical hip populations as a measure of patient reported function and physician assessed joint motion. Often in clinical practice the patient reported HHS sections are completed, however, due to time constraints the physician assessed joint range of motion (ROM) component is not completed. The purpose of this study was to determine if a meaningful difference existed when calculating the HHS with and without the physician reported ROM portion.

Methods: 483 patients who were greater than 12 months post total hip replacement and had completed the entire HHS were included in this study. In order to assess the differences between the HHS with ROM (HHS_N) and the HHS without the ROM (HHS-ROM) a repeated measures t-test was completed. To determine the influence of gender, ASA group (low vs high), and surgery type (primary vs revision) and the HHS calculation a 2X2 repeated measures ANOVA was completed. Finally to determine any association between anthropometrics and HHS bivariate correlations were completed.

Results: The HHS_N and HHS-ROM were significantly different with a mean difference of 4 points between the two groups. Both the ASA score and surgical type demonstrated a significant interaction with HHS calculation method, while gender demonstrated only a main effect for the HHS calculation method. HHS_N and HHS-ROM were significantly correlated with height, while HHS_N was significantly correlated with BMI.

Conclusion: The calculation of the HHS is dependent on the inclusion of the ROM measurement; however, the difference between the two methods is smaller than the minimal important change of 8 that has been previously reported. The small difference in score between the two methods indicates that the usefulness of the HHS as a patient reported outcome is still useful even if the ROM assessment is not collected.

Notes:

Saturday, July 19, 2014

Concurrent Session 12A: Technology and Orthopaedics ***(McCoy's Peak Room)***

Moderator: H. Clayton Thomason III, MD

12:45pm–12:51pm

Harley & Betty Baxter Resident Travel Grant Award

Enhanced Casualty Care from a Global Military Orthopaedic Teleconsultation Program

Matthew D. Laughlin, DO
Brian R. Waterman, MD
Philip J. Belmont Jr., MD
Andrew J. Schoenfeld, MD
Mark P. Pallis, DO

Introduction: Since its advent, telemedicine has facilitated access to subspecialty medical care for the treatment of patients in remote and austere settings. The United States military introduced a formal orthopaedic teleconsultation system in 2007, but few reports have explored its scope of practice and efficacy, particularly in a deployed environment during a time of conflict.

Methods: All teleconsultations placed to the orthopaedic service between April 2009 and December 2012 were obtained and retrospectively reviewed. Case files were abstracted and anatomical location of injury, type of injury, origin of consult (country or Navy Afloat), branch of service, and treatment recommendations, were recorded for descriptive analysis. The final result of the consult was also determined, with servicememembers transported from the combat theater or deployment location defined as medically evacuated. Instances where teleconsultations averted a medical evacuation were also documented as a separate outcome.

Results: Over a 32-month period, 597 orthopaedic teleconsultations were placed, with a plurality derived from Army (46%) and Navy (32%) personnel deployed in Afghanistan, Iraq, or with Navy Afloat. Approximately 51% of consults involved the upper extremity, including 197 hand injuries, followed by lower extremity (37%) and spine (7.8%) complaints. Fractures comprised over half of all injuries, with the hand and

foot most commonly affected. The average response time for teleconsultations was 7.54 hours. A total of 56 servicemembers required immediate evacuation for further orthopaedic management, while at least 26 medical evacuations were prevented due to the teleconsultation system.

Conclusion: The teleconsultation system promotes early access to orthopaedic subspecialty care in a resource-limited, deployed military setting. The telemedicine network also appears to mitigate unnecessary aeromedical evacuations, reducing healthcare costs, lost duty time, and treatment delays. These findings have important meaning for the future of telemedicine in both the military and civilian setting.

Notes:

12:51pm–12:57pm

Navigation in Total Hip Replacement: Is It Worth It?

David A. Iacobelli, MD
Carlos J. Lavernia, MD, FAAOS
Jesus M. Villa, MD

Introduction: Computer navigation has been shown to decrease the variance of component positioning in primary THR. The cost of a navigation system in the U.S. is significant. We created a model that calculates the potential savings or economic benefits of navigation through the reduction or elimination of certain types of revision procedures.

Methods: A review of the literature on costs and times for primary THR was done. Total surgical time from incision to final skin closure and intra-operative time associated with the navigation process were recorded. Professional fees and the costs of revision surgery were estimated.

Results: The average total surgical time for THR was 96.6+/-8.4(SE) minutes for the navigated cohort and 77+/-1.3 minutes for the THR without navigation. Setup of patient trackers and surgical landmarks registration averaged 14.4 minutes for the navigated surgery. The total additional costs (increase in OR time, anesthesia professional fees and the disposable expenses) were $813 for a primary THR using navigation. Reduction by 50% in dislocation and revision rates will yield savings where the system will pay for itself in 5 years doing only 30 cases per year.

Discussion and Conclusion: Assuming 30% of all primary cases are performed with navigation, the incremental cost to the health care system would exceed $300 million a year. Depending on the model and assumptions used to calculate reduction in revisions and dislocations this system could be cost-effective for society if used in high-volume centers. New technology has a tremendous impact on the costs of procedures.

Notes:

12:57pm–1:03pm

The Reliability of Modern Alumina Bearings in Total Hip Arthroplasty

Gwo-Chin Lee, MD

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

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

trends, and relative risk of fracture associated with alumina THA bearings.

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

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

Notes:

1:03pm–1:09pm

New TKA Designs: Did the Patients Notice?

Ryan M. Nunley, MD
Adolph V. Lombardi Jr., MD
Douglas A. Dennis, MD
Craig J. Della Valle, MD
Robert L. Barrack, MD

Introduction: Total Knee Arthroplasty (TKA) is one of the most commonly performed surgical procedures. Despite this 15-20% of patients are not completely satisfied after surgery. Recently new implant designs have been developed to potentially improve patient outcomes. The purpose of this study was to determine what, if any, impact these newer designs had on patient satisfaction and functional outcomes.

Methods: A national multicenter study was designed to quantify the degree of residual symptoms and functional deficits in patients undergoing contemporary TKA at five total joint centers compared to a 10 year old non-modernized TKA system. To eliminate observer bias, data was collected by an independent, third party survey center that had no affiliation with any of the participating centers and was blinded to implant type.

Results: Satisfaction and function data were collected on 621 patients 1-3 years following surgery. Multiple TKA implant types were included (311 cruciate retaining (CR), 88 gender, 65 high flex, 157 rotating platform (RP)). CR TKAs were considered the standard since they had >10 years clinical use. CR TKAs reported more frequently their knee felt "normal" compared to gender TKAs and RP TKAs. Modern TKAs reported more residual symptoms than CR TKAs in the last 30 days including pain, grinding/popping/clicking, swelling/tightness, and stiffness. The only exceptions were high flex TKAs had less problems going up or down stairs and there was a slight trend for RP TKAs to experience less difficulty getting in and out of a car compared to CR TKAs.

Conclusion: When interviewed by an independent third party, patients with modern TKAs reported more residual symptoms and less satisfaction than those with traditional CR TKAs.

Notes:

1:09pm–1:15pm

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

Bradford S. Waddell, MD
Mark S. Meyer, MD
Neil L. Duplantier, MD
Scott F. M. Duncan

Introduction: Joint goniometry is a commonly used tool in clinical assessment. Universal goniometers have been the gold standard for joint angle measurement. Recently, developers have utilized the gyroscope in smartphones to create

goniometer applications. We hypothesize that iPhone-based goniometer applications will fail to reproduce the accuracy of the standard universal goniometer. In this study, we compare two popular iPhone-based goniometer applications with the gold standard universal goniometer for the measurement of the knee, hip and elbow joints.

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

Results: For the knee, average angles measured with the UG were 34.4° and 83.8°, with DrG 38.9° and 83.1°, and with SG 43.1° and 77.8°. For the hip, average angles measured with the UG were 40.1° and 61.8°, with DrG 39.6° and 60.6°, and with SG 41.7° and 58.1°. For the elbow, average angles measured with the UG were 28.7° and 106°, with DrG 29.5° and 96.6°, and with SG 29.2° and 100.4°. Comparing the DrG application to the UG, the interrater correlation coefficient was very high for the knee (ICC=0.966, 95% CI 0.958-0.973) and the elbow (ICC=0.969, 95% CI 0.963-0.975). DrG versus the UG showed moderate correlation for the hip (ICC=0.914, 95% CI 0.895-0.934). Comparing the SG application to the UG, only the elbow showed strong interrater correlation (ICC=0.983, 95% CI 0.979-0.986). Comparing SG to the UG for the hip (ICC=0.838, 95% CI 0.806-0.870) and the knee (ICC=0.896, 95% CI 0.878-0.914) showed poor interrater correlation.

Conclusion: iPhone based applications have many clinical utilities and can save both time and space. No previous study has compared iPhone-based goniometer applications to the standard goniometer in a clinical setting. In our study, we prove that iPhone based goniometry with the DrGoniometer application is a valid and useful tool for measuring joint angles in the clinical setting. There is the possibility of a learning curve that may have resulted in the SimpleGoniometer failing to show a strong correlation in the hip and the knee and the DrGoniometer application not achieving stronger correlation in the hip. All angles averages were, however, within the accepted variation widths reported in the literature. The results of our study disprove our hypothesis and show that the DrGoniometer application for the iPhone is just as accurate as the universal goniometer in measuring joint angles in a clinical setting.

Notes:

1:15pm–1:21pm

Radiation Exposure to the Orthopaedic Surgeon and Efficacy of a Novel Radiation Attenuating Product

Emily Mayekar, MD
Alfonso Mejia, MD

Introduction: Many orthopaedic procedures use fluoroscopy. The present standard to minimize radiation dosage is lead aprons, which are heavy. This study examines the intraoperative radiation dosage to different body parts, and explores the effectiveness of a new lightweight radiation attenuating material.

Methods: For 51 fluoroscopic cases, one attending orthopedic surgeon wore a set of three radiation dosimeters side-by-side at the following body locations: mid-thigh, groin, abdomen, chest, and thyroid. One dosimeter was shielded with a swatch of the new radiation attenuating material, one placed underneath the lead apron in close proximity, and one left exposed as a control. The dosimeters were read, and the total dose of radiation tabulated per body site. The percent attenuation was calculated for both the new material and lead.

Results: The total radiation doses (in mrad) to varying body sites are as follows: thyroid 47, chest 89, abdomen 101, groin 63, and thigh 91. The total dose for these same body parts when shielded by lead and the new material, respectively, are: thyroid 39/ 37, chest 36/41, abdomen 39/37, groin 35/43, and thigh 45/38. The percent attenuation at each of these sites by lead and the new material, respectively, are: thyroid 83/ 79, chest 44/46, abdomen 39/37, and groin 62/68. There was no statistically significant difference in the percent of radiation attenuation by lead and the new material.

Discussion and Conclusion: The radiation dosage to the orthopaedist during fluoroscopic cases varies by body part,

with areas closer to the x-ray generator usually receiving larger amounts. The new radiation attenuating material is as good as lead in cutting radiation dosage to the surgeon, but is lighter. This suggests that, in gown or drape form, it can be used for OR personnel and patients alike to protect them from radiation in a more comfortable fashion.

Notes:

1:21pm–1:27pm

Technological Advances: The Learning Curve Effect

David A. Iacobelli, MD
Carlos J. Lavernia, MD, FAAOS
Jesus M. Villa, MD
Mark D. Rossi, PhD, PT

Introduction: The proper alignment of components is a key factor in TKA to ensure long-term survivorship. The use of electromagnetic (EM) computer navigation was introduced several years ago with the goal of achieving better orientation of the components. Our primary objective was to describe the learning curve of the time required to perform TKA with new technology compared to a conventional jig-based mechanical method. We also wanted to establish the variability of the surgical times in different phases of the curve of each method.

Methods: We utilized 48 knee bone models, and allocated them in two different simulations to perform a knee replacement with and without EM technology (twenty-four per method). A fifth year orthopedic resident performed all simulated procedures. A graphical model (time vs. trial number) of the learning curve was prepared. For the statistical analyses t-test, ANOVA and coefficient of variation were used.

Results: The mean time to perform the surgery in the EM group was significantly longer compared to the time of the mechanical group. We observed three distinct trends within the resultant curve of the EM group. The initial eleven trials showed a decelerating trend due to decreasing surgical times on various successive trials (slope=-0.0016); the middle ones had an almost flat curve due to similar times (slope=-0.0001); the remaining seven had a variable curve (slope=-0.0004). On average, with the EM method, significantly more time was spent performing the initial eleven trials than performing the middle or the final ones.

Discussion and Conclusion: To a novice surgeon, it takes up to 11 trials to "learn" the EM system and to perform it consistently in less time. Novice surgeons should thoroughly familiarize with new techniques and practice with bone models or cadavers before performing operations on patients.

Notes:

1:27pm–1:33pm

Outpatient Joint Replacement: Trends in the Nationwide Private Payer Sphere

Tyler S. Watters, MD
R. Andrew Henderson, MD, MSc
Jonathan A. Godin, MD, MBA
Richard C. Mather III, MD
Samuel S. Wellman, MD
David E. Attarian, MD
Keith R. Berend, MD
Michael P. Bolognesi, MD

Introduction: Recent advances in surgical techniques and perioperative pain management have prompted interest in outpatient hip and knee replacement allowing for safe and efficient care along with high patient satisfaction. The purpose of

this study was to evaluate the recent trends and demographics of these procedures among a large, nationwide private insurance network.

Methods: Patients who underwent total hip arthroplasty (THA), total knee arthroplasty (TKA) and unicompartmental knee arthroplasty (UKA) from 2007 to 2011 were identified from using CPT codes in the PearlDiver heathcare database for the largest private insurance provider in the United States representing roughly 6 million beneficiaries annually. Service location was filtered to identify patients who had procedures in either an outpatient hospital or ambulatory surgery center (ASC) setting and demographics were collected.

Results: Within this private payer network, 1,562 THAs were performed at an outpatient hospital or ASC between 2007 and 2011, representing 3.7% of the 42,759 total THA cases. Similarly, 3,468 (4.7%) TKAs and 1,708 (26.4%) UKAs performed at an outpatient setting during the same time period. The incidence of outpatient THA increased from 0.46 cases per 10,000 patients in 2007 to 0.61 in 2011, representing a 37% increase in total outpatient cases. During this same time period the incidence of outpatient TKA increased from 1.07 to 1.22 cases per 10,000 patients, representing a 17% increase in total number of cases; and outpatient UKA increased from 0.41 to 0.66 cases per 10,000 patients, representing a 66% increase in total number of cases. Outpatient TKA was performed most commonly in patients age 60 to 64 years, with an incidence of 5.46 cases per 10,000 patients in this age demographic. Outpatient THA and UKA were performed most commonly in patients age 55 to 59 years, with incidences of 1.51 and 1.49 cases, respectively, per 10,000 patients**.**

Discussion and Conclusion: This study demonstrates an increased utilization of the outpatient hospital and ASC settings for hip and knee replacement surgery among a large private insurer network from 2007 to 2011. The procedure with the highest relative increase in outpatient setting utilization was UKA.

Notes:

Saturday, July 19, 2014

Concurrent Session 12B: Basic Science *(Heritage Hall)*

Moderator: Samuel I. Brown, MD

12:45pm–12:51pm

Use of a Concentrated Bone Marrow Aspirate for Nonunions and Bone Defects of the Femur and Tibia

Robert D. Zura, MD
*Alexander R. Vap, MD
Kristoff R. Reid, MD

Introduction: Use of bone marrow aspirate concentrate in conjunction with reoperation for patients with nonunions and bone defects of the femur and tibia led to an 83% union rate.

Methods: Forty-seven patients with nonunions of the femur and tibia underwent reoperation. At the conclusion of surgery, bone marrow aspirate from the pelvis was concentrated and applied to the fracture site mixed with cancellous allograft. Demineralized bone and BMP-2 were used as adjuvants according to surgeon preference in addition to the aspirate. Patients were followed with radiographs and clinical exam postoperatively to assess union.

Results: In patients with more than 3 months of follow up, 83% achieved clinical union. Median time between the index procedure and reoperation was 362 days. Average time to clinical union was 10.5 months. Average time to radiographic union was 11.5 months. There were no donor site complications. Factors such as smoking status, diabetes, BMI, infection, and use of BMP were not found to predict failure of treatment. Mean follow-up was 1.4 years. One patient was lost to follow up.

Conclusion: Use of bone marrow aspirate concentrate represents a useful biological adjunct to current techniques for obtaining union of nonunions and defects of the tibia and femur without the risk of donor site morbidity.

Notes:

12:51pm–12:57pm

The Use of Human Amniotic Membrane for Cartilage Repair: A Sheep Study

David M. Conner, MD
*Davis Guebert, BS
Samuel K. Tabet, MD

1) Surgeons have multiple options when addressing cartilage defects in the knee, including both allograft, autograft and microfracture techniques. Studies exist on the uses of human amniotic cells in tissue repair. It is known that amniotic cells' plueripotentency can be influenced to produce chondrocytes and osteocytes through adding demineralized bone. This study evaluates the human amniotic membrane (HAM) mixed with demineralized bone to fill defects in a sheep model. It was hypothesized that this membrane would fill these defects with hyaline-like chondrocytes. 2) Six adult sheep were used in this study. One hindquarter knee of each sheep was utilized to make two cartilage defects: on the femoral condyle and one in the trochlear grove. Three control sheep had the defects left unfilled. Three sheep received HAM from a placenta to fill the defect. The membrane was folded so the cellular layer faced the defect and the joint while demineralized bone was placed between the layers. The membranes were fixed to the femur and to the trochlear. The wounds were closed and the sheep bore weight as tolerated. At six-months, the sheep were sacrificed for evaluation. 3) Of the controls, defects did not fill with hyaline or fibrocartilage. In HAM sheep, 50% of the defects retained the membrane, consistent with other animal models. Membrane defects were examined histologically by a validated scoring system. A strong correlation of very little statistical difference between the test and the normal cartilages was observed. The defects that retained membranes had evidence of diffuse chondrocyte-like cell proliferation of stromal matrix similar to hyaline. 4) HAM is a source of plueripotent cells that can influence chondrogenesis in defects in sheep models. The implications for application in a human model are promising and warrant further study.

Notes:

12:57pm–1:03pm

Decreased T2 Relaxation and Calcification in Rat Knee Articular Cartilage Following Modelled Therapeutic Irradiation at Long-Term Followup

Ian Hutchinson, MD
John Olson, MS
Boyce Collins, PhD
L. Andrew Koman, MD
Michael Munley, PhD
Kenneth Wheeler, PhD
Jeffrey Willey, PhD

Introduction: Premature joint failure is a major source of morbidity among childhood cancer survivors with a relative risk of 54 compared to unaffected siblings. The long-term in vivo effects of radiation therapy on articular cartilage remain unknown. Our goal was to develop a translational platform to characterize late radiation effects in the knee joint articular cartilage. 2)

Methods: Fourteen week old male Fisher 344 X Brown Norway rats (n = 3/group) were exposed to a single 1, 3, or 7 Gy total body dose of 18 MV X-rays plus a small component of particulate radiation using a clinical linear accelerator (LINAC). Age-matched sham-irradiated rats served as controls. One year after TBI, the right hindlimb from each rat was harvested, fixed in formalin and stored in alcohol. MRI was performed on the intact knee joint using a 7T MR scanner. T2 maps were generated using a multi-slice/multi-echo (MSME) pulse sequence. T2 relaxation times of cartilage-cartilage contact areas were analyzed using ImageJ. Additional descriptive assessment was performed using nano-computed tomography. 3)

Results: Cartilage from unirradiated control rats had T2 values within the expected range for fixed rat knees. T2 values from the weight-bearing tibial cartilage-cartilage contact area lining the medial condyle was significantly lower than unirradiated control after 1, 3, and 7 Gy. Likewise, T2 values from the cartilage-cartilage contact area lining the lateral condyle of the tibia were lower after 1 and 7 Gy and marginally lower after 3 Gy. CT analysis revealed discrete intra-substance calcified lesions in the articular cartilage of irradiated knees only. 4)

Discussion and Conclusion: Degenerative joint disease leads to increased T2 relaxation times; decreased T2 relaxation

times have been demonstrated in growth plate cartilage as the result of calcification. Collectively, these findings suggest that cartilage degeneration following irradiation may be the result from a radiation-specific pathologic process in the articular cartilage.

Notes:

1:03pm–1:09pm

Biomechanical Tensile Strength Analysis of Current Techniques for Medial Patellofemoral Ligament Reconstruction

LCDR Patrick W. Joyner, MD, MS
Travis S. Roth, MS-IV
Luke Wilcox, DO
Jeremy Bruce, MD
Ryan Hess, MD
Aaron Mates, MD
Charles A. Roth, MD

Introduction: Current surgical techniques for medial patellofemoral ligament reconstruction (MPFL) may employ suspensory cortical fixation and a human gracilis allograft. We examine the biomechanical strength of suspensory cortical fixation and human gracilis allograft as it compares to the strength of the native MPFL.

Methods: Five different MPFL reconstruction techniques where analyzed using six matched pair human cadavers. Methods of fixation examined: suspensory cortical fixation in patella and femur (DTR), suspensory cortical fixation patella interference screw femur (TRP/ISF), interference screw patella suspensory cortical fixation femur (ISP/TRF), interference screw patella and femur (DIS), two suture anchors patella suspensory cortical fixation femur (SAP/TRF). The vector force was anatomic, directed laterally over the lateral femoral condyle while the knee was flexed 25°. Each method was examined six times; each reconstruction utilizing a new human gracilis allograft. The widths of all patellae were measured; consequently, the force necessary for 50% (subluxation) and 100% patellar displacement (dislocation) could be quantified. The peak force to fixation failure was examined for all methods. A native MPFL strength of 208N was used as a control. Failure was either 100% patellar displacement or fixation failure.

Results: Three forms of reconstruction required force >208N for 100% patellar displacement and fixation failure; DTR, TRP/ISF, and ISP/TRF. All methods of reconstruction required <208N for 50% subluxation. All methods of MPFL reconstruction demonstrated significantly different strengths for 50% and 100% displacement of the patella as well as peak force to failure (F = 8.4, $F\ crit$ = 2.3 (results of ANOVA)). No reconstruction method failed as a result of the human gracilis allograft.

Conclusion: Three methods of reconstruction were stronger than the native MPFL; ISP/TRF being the strongest. Additionally, human gracilis allograft can withstand forces far greater than the native MPFL; therefore, suggesting human gracilis allograft as an acceptable tissue alternative for MPFL reconstruction.

Notes:

1:09pm–1:15pm

Mini-Plating Can Influence Compression Achieved in Long Bone Fracture Fixed with Dynamic Compression Plating (DCP)

Cary Schwartzbach, MD
Jihui Li, PhD
Ilia Iliev

Introduction: Compression plating is essential for primary healing of long bone fractures. Mini-plates can be used for provisional fixation but may potentially enhance or block the compression at the fracture and influence its healing. The purpose of this study was to investigate whether mini- plates and screw placement (neutral vs. eccentric) interfered with the compression and pressure distribution achieved by plating.

Methods: Transverse fractures were created on 20 synthetic bone specimens, divided into two groups based on screw

placement of the mini-plate. In the Compression group, screws were placed eccentrically generating compression. In the Static group, screws were placed neutrally. A DCP was then oriented parallel to the mini-plate, separated by 90 degrees and three screws were tightened on one side. On the other side, screws were eccentrically placed to generate compression. In the control setting, the mini-plate was removed prior to screw compression, whereas in the experimental setting they were left in place. This generated a 2 x 2 matrix of conditions: compression vs. static x experimental vs. control. A pressure sensor was placed in the fracture to monitor the compressive force and pressure distribution during sequential screw tightening.

Results: In the Compression group, mini-plate retention (experimental setting) generated higher fracture compression than the control setting, but lower compressive forces (than the control setting) in the Static group. There were no significant differences in compressive forces between the two control settings, but in the experimental setting the Compression group had higher compressive forces. In the Compression group mini- plate significantly increased the contact area compared to those without mini-plate. Pressure peaks occurred close to the compression plate.

Discussion and Conclusion: This study suggested that mini-plate has a significant impact on the fracture compression.

Notes:

1:15pm–1:21pm

Association of Ulnar Variance with Lunate Morphology; An Anatomic Specimen Study of 630 Human Cadaveric Wrists

Navkirat S. Bajwa, MD
Frederick N. Meyer, MD
Nicholas U. Ahn, MD

Introduction: The exact cause of Kienbock's is not known, though there are thought to be a number of factors predisposing a person to it. While Zapico theorized that Type I lunates occur in ulnar-negative wrists, and type II and III lunates are seen in ulnar-neutral or ulnar-positive wrists, later studies failed to show an association between lunate geometry and Kienböck disease. The exact biomechanical effect of ulnar variance on lunate morphology is unknown. The aim of this anatomic study is to determine the association between ulnar variance and lunate morphology.

Materials and Methods: 630 wrists from 315 cadaveric human specimens from the Hamann-Todd osteological collection in Cleveland, Ohio were examined. Ulnar variance was measured by lining the ulna and radius in a neutral position, as positive, negative or neutral. Lunate was classified according to the Zapico classification. Baseline data of age, sex and race of the specimen were collected. Linear regression was used to analyze the relationship between ulnar variance and lunate morphology. The incidence of positive, negative or neutral ulnar variance was tabulated for each of the three lunate types.

Results: The amount of ulnar variance was significantly associated with the type of lunate morphology. Type 1 lunates were associated with negative ulnar variance in 53%, neutral variance in 19% and positive variance in 28% specimens, while Type 2 and 3 lunates were associated with positive and neutral ulnar variance in 73% cases and negative ulnar variance in only 27% of the specimens.

Conclusion: Based on our study of a large population of adult skeletal specimens, it appears that there is significant association between negative ulnar variance and type 1 lunate shape. The medial shifting of lunate in ulnar negative variant wrists may lead to an increased radial inclination of lunate, which may be a predisposing factor in Kienbock's disease.

Notes:

1:21pm–1:27pm

The Dilution Effect of Intra-Articular Injection Administered After Knee Arthroscopy

Stephanie S. Stopka, BS
Raul Curiel, MD
Glenn L. Wilson, PhD
Albert W. Pearsall IV, MD

Introduction: No reported data has addressed the dilution effect that may affect medication concentrations injected intra-articularly post-arthroscopy, nor the potential variation in concentration throughout the joint of such drugs administered after knee arthroscopy. This study examines if agents delivered intra-articularly after knee arthroscopy will be diluted by residual arthroscopic fluid, and if there is a variation in concentration gradient of injected agents throughout the knee joint.

Methods: Diagnostic arthroscopy was performed on six cadaveric knees, followed by one intra-articular injection of blue dye solution, and intra-articular aspirates were gathered from three distinct locations. Aspirates were filtered, centrifuged, and analyzed via spectrophotometer to determine the absorbance, and thus calculated concentration, of the supernatant as compared to the dye initially injected. Tukey's Multiple Comparison Test, a one-way ANOVA, and Bartlett's Test for Equal Variances were applied to statistically compare the aspirates versus the initial dye, as well as each of the aspirate locations.

Results: No significant difference between the three sampling sites was noted, indicating no specific point on the femoral condyles or patella had exposure to a higher concentration of dye. There was a significant difference in dye concentration noted at all three aspiration points when compared to the dye's initial concentration.

Discussion and Conclusion: The concentration of fluid injected intra-articularly into the knee post-arthroscopy is significantly diluted by 27% despite attempts to extract all fluid. Furthermore, the injection location does not cause an asymmetrical concentration of medication within the joint. The data suggest that in-vitro experiments evaluating chondrotoxicity of various anesthetic agents may not accurately reflect the actual concentration of drug within the knee joint unless dilution effects are taken into account.

Notes:

1:27pm–1:33pm

Big Heads and Trunnions: Tribocorrosion Turbocharged

Jesus M. Villa, MD
Carlos J. Lavernia, MD, FAAOS
David A. Iacobelli, MD

Introduction: The use of large heads has increased 10 fold since the introduction of highly cross-linked bearing surfaces. Cobalt-chromium (Co-Cr) has approximately twice the modulus of elasticity of titanium (Ti) alloys. Most stems used in the USA today are made out of Ti alloys and over 90% of the heads implanted are Co-Cr. Our objective was to assess the consequences of using large heads on the resulting stresses and strains in the trunnion.

Methods: A 3D model was constructed of a standard 12/14 trunnion using Simulia's ABAQUS. Various head sizes were modeled. The model had 130.6k nodes and 93.2k elements. To better capture the surface stress, first order membrane elements were overlaid on tetrahedron elements. A pressure load of 2.1 MPa was applied to simulate a 2.6 body-weight force at the hip.

Results: Trunnions had a significant increase in stresses and strains as the heads increased from 28mm to 40mm. For a 28mm diameter ball the maximum principal stress was 20.3 MPa, for a 32mm ball it was 36.0 MPa, and for a 40mm ball it was 43.8 MPa. Our data shows a two-fold increase in trunnion stresses across the ball diameters studied.

Discussion and Conclusion: Our model suggests that increase in head size significantly augments the stresses and strains at the trunnion-head junction. This increase in motion and stresses at the trunnion head junction can significantly contribute to tribocorrosion and metal ion release. This effect can be magnified if an additional interface exists, such as in a double modular trunnion.

Notes:

1:33pm–1:39pm

A Next Generation Anatomically Contoured Ceramic Femoral Head

Andrew A. Freiberg, MD
*Kartik Mangudi Varadarajan, PhD
Michael P. Duffy, MS
Thomas Zumbrunn, MS
Harry E. Rubash, MD
Henrik Malchau, MD, PhD
Orhun K. Muratoglu, PhD

Introduction: Large diameter femoral heads have been successfully used to prevent dislocation after Total Hip Arthroplasty (THA). However, recent studies show that the distal region of contemporary femoral heads can impinge on native soft-tissues, particularly the iliopsoas, leading to activity limiting anterior hip pain. To address this we developed an Anatomically Contoured large diameter femoral Head (ACH) that maintains the hemispherical profile of a contemporary large diameter head above the equator, while contouring the distal profile below the equator for soft-tissue relief. The soft tissue friendly design of the ACH implant was optimized to maintain the dislocation benefits, and to not alter the wear performance, and load bearing femoroacetabular contact area of conventional large heads. This was verified via dislocation analysis, hip simulator wear testing, and finite element analysis (FEA).

Methods: Implant stability was evaluated by simulating dynamic hip dislocation in MSC Adams. A 36mm ACH, a 36mm conventional head, and a 28mm conventional head were tested under two dislocation modes: (A) Posterior dislocation with internal hip rotation; (B) posterior dislocation with combined hip flexion and adduction. Wear performance of 36mm ceramic ACH implants and 36mm conventional ceramic heads articulating against UHMWPE liners was compared with a 12-station AMTI hip simulator. Two types of acetabular liners were tested: compression molded conventional PE, and highly cross-linked VitE-PE liners. To assess the femoroacetabular contact area, a FEA was completed with a 36 mm conventional head and a 36mm ACH implant. The femoral heads were modeled as rigid and articulated against UHMWPE acetabular liner modeled as plastically deformable. Loading cases corresponding walking, chair sit and deep-knee bend were analyzed.

Results: The dislocation analysis did not show any differences between the 36 mm ACH implant and the conventional 36 mm head. Both showed increased jump distance compared to the 28 mm conventional head. There was no difference between wear rate of the ceramic ACH implants and the conventional ceramic heads articulating against either UHMWPE liner materials (current results based on 2 million cycles). For example, average wear rate of conventional PE liners articulating against, the conventional ceramic heads and the ceramic ACH implants, was 21.4 ± 4.1 mg/MC and 20.8 ± 4.2 mg/MC, respectively. The FEA analysis also did not show any difference in articular contact area for the ACH and conventional heads articulating against UHMWPE liners.

Conclusion: This study showed that, as intended, an anatomically contoured large diameter femoral head designed to provide soft-tissue relief, maintains the stability of conventional implant of the same size, and does not alter the wear performance, and the load bearing articular contact area.

**The FDA has not cleared this drug and/or medical device for the use described in the presentation.* *(Refer to page 47).*

Notes:

Southern Orthopaedic Association

Scientific Poster Exhibits

July 17-19, 2014

Poster presenters will have an opportunity to
report their findings at designated times indicated
on the Scientific Program Schedule.

Scientific Posters will be on display in Heritage Hall
during the Scientific Program on Thursday, Friday, and Saturday.
Please plan to visit the Scientific Posters.

2014 SOA Poster Presenters

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Poster Abstracts
(Heritage Hall)

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Poster 1

Is Disk Degeneration Associated with Canal Area and Interpedicular Distance in the Lumbar Spine? An Anatomic Study of 1072 Human Cadaveric Specimens

Navkirat S. Bajwa, MD
Frederick N. Meyer, MD
Nicholas U. Ahn, MD

Introduction: Due to our upright posture while walking the lower lumbar levels i.e. L3, L4 and L5 are at a greater risk of degeneration, It is believed that lumbar degeneration begins in the disc, where desiccation and collapse of the disc leads to instability. With advancing age there is increased wear and tear of ligaments and soft tissues leading to changes in the bony anatomy and compensatory arthritis in the facet joints. The purpose of this study is to find out if there is an association of degenerative disc disease with canal area and interpedicular distance in the lumbar spine.

Methods: 1072 cadaveric human specimens were examined for evidence of facet and disc arthrosis in lumbar spine. Based on studies by Kettler, we used grading systems for facet arthrosis and disc degeneration from Grade 0 to 4 on a continuum from no arthritis to ankylosis. Digital calipers were used to measure the following (L1-L5): sagittal canal diameter (sd), interpedicular distance (ipd), and pedicle length (pl). Canal area at each level was calculated using a formula that was verified by computerized measurements. A standard distribution for each level was created, and values that were -2SD below mean were considered as being congenitally stenotic.. Linear regression test was used to find the association of degenerative disc disease with canal area and interpedicular distance.

Results: DDD was significantly associated with canal area changes at the L5/S1 level. A significant association was found between IPD and DDD at levels L1/2, L2/3, L3/4.

Conclusions: Based on our study of a large population of adult skeletal specimens, it appears that there is a significant association between degenerative disc disease and canal area at the level of L5/S1. DDD is related to changes in IPD at levels L1/2, L2/3, L3/4.

Poster 2

An Accelerated Rehabilitation Protocol for Acute Lateral Patellar Dislocation: Report of Two Cases

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*Adam M. Pickett, MD
Raymond Chronister, ATC
CDR John-Paul Rue, MD
CAPT David J. Keblish, MD

Introduction: Acute lateral patellar dislocation occurs with a valgus/rotational stress on the knee in a slightly flexed position. The standard of care for first-time dislocators without concomitant chondral or ligamentous injury is a trial of nonoperative therapy. This typically involves several weeks of immobilization in full extension, followed by physical therapy focused on restoring knee range of motion and quadriceps strength. Most published series require two to four months of care before return to sport is possible. We believe that immobilization in extension promotes knee stiffness and pain, while stressing the already-injured medial patellofemoral ligament (MPFL).We have begun immobilizing the knee in maximal flexion, which concentrically reduces the patellofemoral joint, reduces stress on the medial patellar stabilizers, and restricts swelling and hemarthrosis formation.

Methods: Two cases of collegiate athletes are presented who were treated using an accelerated rehabilitation protocol. This protocol involves 24 hours of immobilization in maximal flexion, followed by active assist range of motion therapy, quadriceps strengthening, and interferential muscle stimulation. A review of MPFL anatomy provides an anatomic justification for this protocol.

Results: Both patients achieved full active range of motion in the knee 24 hours after injury. Average return to unrestricted competition was three days. Neither patient has experienced recurrent patellar instability during an average 18 months follow-up.

Discussion and Conclusion: Clinical studies of acute lateral patellar dislocation show soft tissue swelling and hemarthrosis formation to be significant contributors to knee stiffness that delays return to full activity. This is likely worsened by traditional non-operative protocols that immobilize the knee in full extension. Our two cases illustrate the potential benefits of immobilization in flexion and aggressive rehabilitation after lateral patellar dislocation, with return to college-level athletics weeks-to-months earlier than any previously published work.

Poster 3

The Cost of Medicare Intermediary Denials of Hip and Knee Replacements

C. Lowry Barnes, MD
Paul K. Edwards, MD
D. Gordon Newbern, MD

Introduction: Medicare intermediary denial of primary joint replacements has become common over the past couple of years. Our community hospital had a marked increase in denials following the assignment of a new intermediary. The purpose of this study was to document the initial monetary impact of these denials.

Methods: A retrospective review of the first 361 Medicare total joints (181 hips and 180 knees) after a new intermediary began processing claims was performed. Initial denial rate, positive response rate to first appeal, as well as delay in payments because of these denials were documented

Results: 42 hips (23%) and 47 knees (26%) were initially denied. Following submission of more documentation by the hospital and surgeons, 38% of the 42 hips and 34% of the 47 knees were subsequently approved. Secondary appeals are now being processed, and those will be included. Average time to hospital payment in cases that were not appealed was 18.3 days. Those paid after the first appeal averaged a time to payment of 126.1 days.

Discussion: A new intermediary increased the denial rate from 0 to greater than 20 percent and significantly increased our time to payment. Importantly, the hospital has still not been paid for 60% of the initial denials (just under 16% of all claims). Third party intermediaries can place financial strain on hospitals by aggressive interpretation of Medicare rules.

Poster 4

Reduction of Fluoroscopy Time and Radiation Dosage Using an Innovative Split-Tip Guide Wire for Percutaneous Pedicle Screw Placement

Brandon W. Cook, MD
Bradford S. Waddell, MD
David Briski, MD
Joseph M. Zavatsky, MD

Introduction: Despite the many benefits of minimally invasive spine surgery, inherent risks to the patient and surgeon exist. Previous studies have shown increased exposure to radiation with MIS surgery secondary to the need for increased fluoroscopic surveillance, which can lead to a higher probability of developing cataracts and / or malignancy. Additionally, inadvertent advancement of standard guide wires through the vertebral body can occur especially in osteoporotic bone, placing vital structures located ventral to the spine at risk. This study evaluates the benefit of utilizing a novel split-tip guide wire for percutaneous pedicle screw placement and its affect on radiation exposure.

Materials: Forty consecutive cases of MIS transforaminal lumbar interbody fusion (TLIF) at L5-S1 were retrospectively evaluated: Group 1: Standard straight guide wire, 20 patients Group 2: Split-tip guide wire, 20 patients Except for the type of guide wire used, the same operative technique was used in each case, which included bicortical S1 screw fixation. For each case we recorded total fluoroscopy time, radiation dosage, total operative time and patient complications.

Results: Total fluoroscopy time per case for Group 1 averaged 231.1 seconds vs. 154.2 seconds for Group 2 (Statistically Significant). The decrease in fluoroscopy time did lead to a reduction in radiation exposure in Group 2 [16.22 rads vs. 8.69 rads (Statistically Significant)]. There was no significant difference in total operative time between the two Groups. Complications included inadvertent advancement of two S1 standard guide wires, both occurring in separate patients in Group 1. No inadvertent advancement of the split-tip wire occurred in Group 2. Immediate post-operative abdominal

computed tomography (CT) scans with contrast were negative in both patients in Group 1.

Conclusion: Minimally invasive spine surgery has inherent advantages and disadvantages. One of the disadvantages includes the need for increased fluoroscopy, which results in increased radiation exposure. This radiation exposure can be minimized with the use of a split-tip guide wire for percutaneous pedicle screw placement. Secondary to the nature of its design, this split-tip guide wire prevents the inadvertent advancement of the wire through the vertebral body, which reduces the need for constant surveillance with fluoroscopy. The potential advantages of this split-tip wire may be highlighted at the S1 level. Although bicortical S1screw purchase increases stability, tapping the anterior S1 cortex is required, which removes the physical stop that can prevent inadvertent advancement of the guide wire into the pelvic cavity. The split-tip guide wire may prevent inadvertent advancement through any osteoporotic vertebral body into the abdominal cavity. In this study, we have shown that this novel split-tip guide wire reduces the need for fluoroscopic surveillance during percutaneous pedicle screw insertion, thereby reducing potentially harmful radiation exposure to both the patient and surgeon. We found that using this technique significantly decreased fluoroscopy time by 33% and radiation dosage by 46%. Finally, if inadvertent advancement of standard guide wires into the abdominal cavity occurs, a costly and radiation-heavy CT scan may be required to identify injury to any vital abdominal structures

Poster 5

Accuracy of Acetabular Correction in Periacetabular Osteotomy

Stephen T. Duncan, MD
Jeffrey J. Nepple, MD
Gail Pashos
Geneva Baca
Angela Keith
Perry L. Schoenecker, MD
John C. Clohisy, MD

Introduction: Acetabular reorientation during the Bernese periacetabular osteotomy (PAO) is complex and is a key step in optimizing clinical outcomes of the procedure without creating secondary femoroacetabular impingement. Criteria for an optimal acetabular correction have not been determined. This study proposes radiographic target ranges for the PAO acetabular reorientation and examines the frequency in which the acetabular correction is within the predetermined target ranges.

Methods: Retrospective review for patients with classic acetabular hip dysplasia undergoing PAO from January 2007 to December 2011 was performed. Clinical data including patient demographics and radiographic measurements were collected. Pre- and post-operative AP pelvis, false profile, and frog lateral radiographs were evaluated. We defined the acceptable ranges for acetabular reorientation to be: lateral center edge angle (LCEA, 25o-40o), anterior center edge angle (ACEA, 18o-38o), acetabular inclination (AI, 0o-10o), extrusion index (0-20%), and medial offset (0-10 mm).

Results: 93 females and 27 males were reviewed with a mean age of 27 years. Comparison of radiographs demonstrated an average improvement of 18.4° in the LCEA with 78% accuracy, an average improvement of 17.3° in the anterior center-edge angle with 86% accuracy, and an average improvement of 14.7° in acetabular inclination angle with 86% accuracy. The extrusion index improved an average of 18.9% with 75% accuracy, and the hip center was translated medially an average of 4.8 mm with 62% accuracy. When combining the LCEA, the ACEA, the acetabular inclination angle, and the extrusion index, only 51% PAOs met the target ranges for all the parameters.

Conclusion: Our proposed radiographic target ranges for individual parameters of acetabular reorientation were achieved in the majority of cases (62-86%), while obtaining desired corrections for all four parameters simultaneously was less common (51%). Refined strategies to consistently obtain optimal, multidimensional acetabular correction with the PAO are needed.

Poster 6

Combined Surgical Hip Dislocation and Proximal Femoral Osteotomy for Severe Hip Deformities

Stephen T. Duncan, MD
Geneva Baca
Angela Keith
Perry L. Schoenecker, MD
John C. Clohisy, MD

Introduction: In patients with severe proximal femoral deformities, the combined surgical hip dislocation (SHD) and proximal femoral osteotomy (PFO) can be performed to optimize deformity correction while also addressing intra-articular pathologies. There is a paucity of data regarding the

details of the surgical technique and the clinical efficacy of the procedure. The purpose of this study was to analyze the early clinical and radiographic results of combined SHD/PFO in treating complex proximal femoral deformities and provide updated refinements on surgical technique.

Methods: Retrospective review of patients who underwent combined SHD/PFO was performed. Clinical data including patient demographics, radiographic measurements, and patient-rated outcome scores were collected.

Results: 17 patients (17 hips) with 8 females and 9 males were identified. Previous history of SCFE and complex FAI were the most common etiologies for the deformity (41.2%). The average age was 17.6 years (range, 11-31), and average follow-up was 2.1 years. Conversion to total hip arthroplasty was performed in 2 patients (11.8%). In the remaining patients, the Harris Hip score improved significantly by 20.0 points. No change in radiographic OA occurred. The average neck-shaft angle was increased 134.1o to 140.4o. The trochanteric height improved from -15.2 mm to -5.4 mm. The head/neck offset ratio improved from -0.07 to 0.08. The frog lateral alpha angle (76.1o to 59.4o) and the cross-table alpha angle (70.9o to 44.1o) also improved.

Conclusion: Treatment of severe hip deformities with combined SHD/PFO demonstrated consistent radiographic deformity correction with improved head/neck offset and height of the trochanter in relation to the femoral head. The clinical data indicates combined SHD/PFO is associated with improved hip function and improved outcome scores in most patients with an acceptable rate of conversion to total hip arthroplasty. Recent refinements in the technique have facilitated surgical precision.

Poster 7

Inferior Glide Test for Adhesive Capsulitis, a Physical Exam Maneuver

Katherine C. Faust, MD
Brendan R. Fulmer MD
Michael J. O'Brien, MD
Felix H. Savoie III, MD

Introduction: The inferior glide test was developed to address early diagnosis of adhesive capsulitis. It involves a force to glide the humeral head inferior relative to the glenoid with the arm abducted approximately 40 degrees in order to apply direct, gentle pressure to the inferior capsule. A test is positive if there is pain with the inferior glide of the humeral head in the IGHL complex

Methods: Charts from February 2013-August 2013 were audited to find patients with a diagnosis of adhesive capsulitis. Risk factors, laterality, sex, age, and inferior glide test results were recorded. A similar number of patients without adhesive capsulitis diagnoses was collected. Our study was designed evaluate the inferior glide test, to test the hypothesis that a positive inferior glide test would be positive in all stages of adhesive capsulitis and that the test has intraobserver reliability.

Results: 26 consecutive patients with a positive inferior glide test were all shown to have adhesive capsulitis. These were compared to 26 consecutive new patients with a shoulder pain. All patients with the disease had a positive test; all patients without the disease had a negative test (sensitivity and specificity 100%). In the adhesive capsulitis group, 21 patients were female (81%) and 5 were male (19%). 7 (27%) were diabetic, and 4 (15%) had thyroid issues. The right shoulder was affected in 15 patients (57.7%), while the problematic side was the left in 9 patients (34.6%) and bilateral in 2 (7.7%). In the patients with negative inferior glide tests, 11 (42%) were female and 15 (58%) were male. Their ultimate diagnoses were: rotator cuff pathology (13), glenohumeral arthritis (5) labral tear (2), neuropathic joints (2), AC pathology (2), sternoclavicular sprain (1) and clavicle fracture (1).

Conclusion: The inferior glide test is an accurate physical exam test for adhesive capsulitis.

Poster 8

Defining "Acute" and "Chronic" in Orthopaedic Sports Injuries: A Review of Three Common Tendon Injuries

James H. Flint, MD
*CPT Adam M. Pickett, MD
LT Christian Balazs, MD
MAJ Jeffery Giuliani, MD
CDR John-Paul Rue, MD

Introduction: Defining sports injuries as acute or chronic is clinically relevant in many cases, especially in tendon injuries. The current literature varies greatly in defining the terms acute and chronic. A recent study published consensus definitions derived from a literature review, with the goal of clarifying

and standardizing the Orthopaedic literature. Of note, the study found great disparity among definitions of acute and chronic, even among seemingly similar injuries (i.e. tendon injuries). The current study expands on this initial effort by isolating tendon injuries and critically evaluating them through anatomic, physiologic, and clinical perspectives in order to determine if the consensus definitions are valid.

Methods: A literature review was conducted to critically evaluate the anatomy and physiology of three common tendon injuries: Achilles tendon, distal biceps tendon, and pectoralis major tendon rupture. Articles were isolated from various databases and clinical search engines using keywords to identify relevant literature.

Results: After a tendon ruptures, it undergoes three stages of healing, each having a specific time period from injury; inflammatory phase: 0-48 hours; proliferative phase: 2days-6 weeks; remodeling phase: 6 weeks to 1 year. Distal biceps and distal pectoralis major ruptures are similar anatomically, in that they both typically rupture at the tendon/bone interface. Achilles tendon ruptures are unique; the majority of them occur intratendonously, at an anatomic hypovascular zone.

Conclusion: We support the consensus definition of acute tendon ruptures because they are consistent with the physiologic aspects of tendon healing. The consensus definition of an acute injury in the Achilles tendon is earlier, likely because of the tears location to the tendon's vascular supply. However, the chronic tendon injuries as a group a better classified as occurring after 8 weeks from injury, which coincides with the remodeling phase of healing and may imply more complicated surgical repair techniques.

Poster 9

Trends in Stand-Alone Platelet-Rich Plasma Injections in the United States

Jonathan A. Godin, MD, MBA
R. Andrew Henderson, MD, MSc
Benjamin D. Streufert, BS
Richard C. Mather III, MD

Introduction: Platelet-rich plasma (PRP) has been used clinically for its healing properties attributed to the increased concentrations of autologous growth factors and secretory proteins. Although there are numerous clinical studies evaluating the efficacy of PRP in treating orthopaedic conditions, there are no published data concerning the specifics of its utilization.

Methods: Patients who underwent stand-alone PRP injection from July, 2010 through 2011 were identified by searching Current Procedural Terminology (CPT) code 0232T in a national database of orthopaedic insurance records. Results were reported for each variable as the incidence of procedures identified per 10,000 patients searched in the database.

Results: In total, 1,507 PRP injections were identified between July, 2010 and December, 2011. The incidence of injections increased over the study period, from 0.37 injections per 10,000 patients in July, 2010 to 0.41 in December, 2011. PRP injections were performed most commonly in patients between the ages of 45 and 49 years, with an incidence of 0.57 injections. There was a male-to-female ratio of 1.07. The Western region of the United States had an incidence of 0.51 injections per 10,000 patients compared with ¬0.47, 0.43, and 0.32 in the Northeast, South, and Midwest, respectively. Average physician charges per injection remained stable at $939 in the third quarter of 2010 and $933 in the fourth quarter of 2011. ICD-9-D codes for plantar fibromatosis, lateral epicondylitis, and knee cruciate ligament sprain were most commonly associated with PRP injections.

Discussion and Conclusion: A 14% increase in the rate of PRP injections was observed between July, 2010 and December, 2011. Along the same timeframe, the average physician charge remained stable. The highest incidence of injections was performed in patients between the ages of 45 and 49 years, and there were no gender differences. The Western region of the United States was found to have a higher incidence of PRP injections.

Poster 10

Nonsurgical Treatment of Osteochondritis Dissecans of the Glenoid in a Throwing Athlete: A Case Report

Luis C. Grau, MD
Michael G. Baraga, MD
Jean Jose, MSc, DO

Osteochondritis dissecans most commonly occurs in the femoral condyles, talus and capittelum. Osteochondritis dissecans

of the glenoid is a rare entity with only a handful of cases reported in the literature. Moreover, to our knowledge, this is the only case in the literature which demonstrates successful healing of an osteochondral lesion of the glenoid following conservative management in a throwing athlete. Osteochondritis dissecans likely occurs due trauma and ischemia of subchondral bone. Repetitive microtrauma to the shoulder joint predisposes throwing athletes to developing these lesions. It has been proposed in the literature that a tight posterior glenohumeral joint capsule leads to posterior translation of the humeral head in the late cocking phase of pitching, which in turn causes shear and compression forces on the posterior aspect of the glenoid fossa. We present a case of a 16 year old baseball player who presented with 4 months of right shoulder pain made worse by throwing. Examination of the right shoulder showed a painful, but stable glenohumeral joint with 35 degree internal rotation deficit as compared to the unaffected side and MRI arthrogram of the right shoulder demonstrated a large posterior glenoid osteochondral lesion. The patient was restricted from throwing activities for 8 weeks and performed daily range of motion exercises. An MRI arthrogram of the right shoulder 4 months after initiating conservative treatment demonstrated healing of the osteochondral lesion and clinically the patient had improvement of symptoms. Successful surgical treatment of osteochondritis dissecans of the glenoid with debridement, removal of loose bodies and drilling of subchondral bone to promote generation of fibrocartilage has been described in the literature. Our case report suggests that removing the inciting trauma and improving glenohumeral mechanics with physical therapy can allow for, as well as promote, adequate healing of osteochondritis dissecans of the glenoid in a throwing athlete.

Poster 11

Scapular Nonunion with Subscapularis Herniation: A Case Report

Luis C. Grau, MD
Kevin Chen, MD
Benjamin Goldberg, MD

Nonunion of scapula fractures is extremely rare. In our review of the literature, we found only two case reports of scapular body fractures that went on to nonunion. In both of these cases, open reduction and internal fixation with reconstruction plates and bone graft was successful at eliminating pain and restoring function. We report a case of a patient with a symptomatic, scapular body defect from a nonunon with herniation of the subscapularis muscle who we treated successfully with acellular graft jackets and bone product. Our patient was a 52 year right hand dominant female complaining of persistent posterior shoulder pain with activity and at rest who had sustained a right clavicle and scapular body fracture 14 months prior to presenting to our office. The patient had full active and passive range of motion of her extremity and was neurovascularly intact distally. A CT scan of her shoulder showed a 4 cm in length by 2 cm in width oval defect of the inferior scapular body. Herniation of the subscapularis muscle through the fracture site was likely the reason for nonunion and the cause of our patients pain 14 months after injury. We elected against plating with bone grafting. Instead we sewed acellular bioimplant jackets onto the ventral and dorsal surfaces of the scapula with bone product sandwiched in between in order to prevent the herniation of the subscapularis muscle through the defect. Our patient had full relief of her symptoms 8 weeks postoperatively and maintained full range of motion of the extremity. Our case demonstrates a novel treatment option in a rare case of a scapula body fracture that went on to nonunion.

Poster 12

A Study Comparing 3 Unique Injection Protocols Used During Knee Arthroscopy on Patient Outcomes in the Immediate Post-Operative Period

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*Brian Cripe, BA
Stephanie E. Pawlak, BA
Scott C. Montgomery, MD
Misty Suri, MD

Introduction: Intra-articular and intra-capsular injections are commonly used during knee arthroscopy to enhance pain control in the immediate post-operative period. The current literature suggests that a combination of medications from different classes may provide superior pain control yet no consensus as to the optimal combination exists.

Methods: With IRB approval, a retrospective review was conducted of 25 patients for each of 3 board-certified sports medicine orthopaedic surgeons who routinely use their own unique injection protocol during knee arthroscopy. Pain scores

were extracted from the medical records and evaluated upon arrival in the PACU, at 30 minutes and 2 hours post-arrival and at the time of discharge. All narcotics administered during their stay were noted along with any other modalities used for pain. Incidents of nausea, vomiting, and pruritus were noted along with any medications administered for these. Times to first ambulation and to discharge were evaluated. Admission rates were noted. Patients were grouped by injection received from their treating surgeon and the 3 different groups were evaluated to identify any significant differences.

Results: No significant differences were seen between the groups when comparing baseline demographics, pre-operative medications given, or total amount of intra-operative fentanyl demonstrating that these variables are not influencing outcomes. Significant differences were seen between the groups in pain scores upon arrival in the PACU and at 30 minutes after arrival. Time to ambulation and time to discharge also showed significant differences based upon injection received.

Discussion and Conclusion: By eliminating any influence from other variables, the choice of injection protocol used appears to influence pain and recovery in the immediate post-operative period. The injection cocktail demonstrating the lowest pain scores, fastest time to ambulation and quickest discharge rates contains drugs that cover the widest array of medications.

Poster 13

Quantification of Native Anterior Cruciate Ligament Length via Lateral Radiographic Landmark

LCDR Patrick W. Joyner, MD, MS
Travis Roth, MS-IV
Luke Wilcox, DO
Jeremy Bruce, MD
Ryan Hess, MD
Christopher O'Grady, MD
Charles A. Roth, MD

Background: Graft tunnel mismatch, a complication of anterior cruciate ligament reconstruction, is a condition in which the bone-patella-tendon-bone autograft or allograft is either too long or short, and can result in compromised fixation. We aim to find a radiographic landmark, on lateral knee X-ray, which will allow for a simple, easy, and reproducible method of quantifying native ACL length.

Materials and Methods: 130 patients (66 male & 64 female), underwent, as a standard part of their knee arthroscopy procedure, measurement of their native ACL. These native ACL's where measured percutaneously with a spinal needle. The lengths of the native ACL's where compared with one lateral knee X-ray landmark and a clinical landmark: Blumensaat's line and patellar ligament, respectively. The mean percent difference, absolute difference, and a correlation between Blumensaat's line and the native ACL length where calculated.

Results: In males, the average length of the ACL was 32.5mm, Blumensaat's line was 33.0mm, and the patellar ligament was 49.2mm. The absolute difference between Blumensaat's line and the native ACL was 1.2mm±1.3mm, the mean percent difference 0.9%±2.9, and the correlation coefficient was 0.88. The correlation coefficient between the patellar ligament and the native ACL was 0.08. In females, the average length of the ACL was 30.6mm, Blumensaat's line was 30.3mm, and the patellar ligament 44.2mm. The absolute difference between Blumensaat's line and native ACL was 1.3mm±1.3mm, the mean percent difference was 0.4%±2.8, and the correlation coefficient was 0.84. The correlation coefficient between the patellar ligament and native ACL was 0.1.

Conclusion: As a general rule, regardless of age or sex, the length of Blumensaat's line is equivalent to length of the native ACL.

Poster 14

Results of the First 29 Patients with 2 Year Follow-Up with a Low Friction Anatomic, Locked and Constrained Total Knee

Gerhard Maale, MD
Paul Crabtree, BSME
Ryan Dees, BSIT

Introduction: Dislocation of present day hinged total knee joints, remains a problem particular in obese patients and patients with large soft tissue resections associated with wear and debris, tumors or treatment of infected total joints. Component wear continues to a problem with the non anatomic hinge with multiple moving parts, with failures occurring 5-10 years.

Methodology: The results of AMTi cycle testing of the new anatomic locked hinged knee and 2 year clinical results were analyzed. Implantation considerations were severe varus-val-

gus angulation, multidirectional instabilities, tumor, infected total knee, instability with primaries, and revisions with a large amount of wear and debris. Patient satisfaction, range of motion, and complications were reviewed. All patients had release of collateral and full posterior release.

Results: Cycle testing showed less wear than published primary total knees. Clinical results showed an average of 100 degrees of flexion and within 2 degrees of full extension. Satisfaction rate was high. 1 person required amputation for a persistent infection, 2 patients with wound complications developed arthrofibrosis and one ruptured a quadriceps mechanism with by a rock was revised to another prosthesis for infection. 2 patients had dislocation of the patella.

Conclusion: This novel hinged total knee prosthesis is low friction, has a good success rate at 2 years, should indicated in a variety of complicated total knee joints, both primary and revisions. Patella tracking and balancing is key for getting good results.

Poster 15

Factors Affecting the Perioperative Outcomes Following Periacetabular Osteotomy

Stephanie W. Mayer, MD
Nicole A. Zelenski, BS
Vasili Karas, MD
Steven A. Olson, MD

Introduction: The Bernese Periacetabular Osteotomy (PAO) is a widely used procedure for hip preservation in young patients. The purpose of this study was to determine the relationship between body mass index (BMI), age, smoking status, and other co-morbid conditions to the rate and type of complications seen in the perioperative period.

Methods: A retrospective review of electronic data of 80 hips in 73 patients was undertaken to determine pre- and post-operative demographic information, pain scores, center-edge and Tonnis angles, intraoperative estimated blood loss, and perioperative complications. Patients were grouped into low (30) BMI groups. A two-tailed t-test was used for continuous variables and Mann-Whitney U Test for non-parametric data to compare low and high BMI groups.

Results: The overall complication rate was 40% in the high BMI group and 48% in the low BMI group. 45% of the complications in low BMI patients were major (3.3% requiring reoperation), versus 100% in high BMI patients (20% requiring reoperation). The rate of wound dehiscence and infection was 30% in high BMI patients and 8.3% in low BMI patients. Mean estimated blood loss in high BMI patients was 923.75mL, and 779.25mL in low BMI patients. Pain scores improved significantly, and Tonnis and center-edge angles improved to normal ranges in both groups. Age was similar in patients with complications (27.15 years) and without complications (27.69 years). Two of the four patients with diabetes mellitus developed wound infections. There were no major complications in smokers.

Discussion and Conclusion: Patients in the high BMI group had a higher rate of major wound healing and infectious complications and reoperations. The low BMI group had a higher rate of prominent hardware and iliopsoas tendonitis. The post-operative pain scores and radiographically measured acetabular correction achieved were similar between the groups.

Poster 16

When the MRI Says “Negative”, but the Patient Still Hurts: Kim and Stewart Lesions

John C. McConnell, MD

Purpose: To enhance awareness of potentially under-recognized problems due to posterior/inferior labral displacement/flattening and capsular laxity (Kim lesions) and anterior/inferior labral displacement/flattening and capsular laxity (Stewart lesions) which may be missed by MRI

Methods: 29 patients were referred for “shoulder pain” with “negative” MRIs. 4 of 29 patients remained symptomatic after previous surgery. All were examined by the author using physical exam to identify anterior/inferior and posterior/inferior multidirectional subluxability as advocated prior to 1970 by Marcus Stewart which incorporates the posterior/inferior exam described by Kim (Kim’s test). All were examined arthroscopically with specific probing and video recording to identify labral displacement/flattening and capsular laxity (Kim lesions and Stewart lesions).

Results: All patients with “negative” MRIs had multidirectional subluxability with elements of posterior/inferior and anterior/inferior instability, but could be identified as

predominantly anterior/inferior or posterior/inferior using physical exam Stewart/Kim test. Predominently anterior/inferior subluxability on exam correlated with arthroscopic of predominantly anterior/inferior capsular laxity and labral displacement/flattening (Stewart lesions). Predominantly posterior/inferior capsular laxity and labral displacement/flattening (Kim lesions) correlated with posterior/inferior on physical exam. History indentified traumatic axial loading, torsion and sometimes impact with posterior/inferior instability and traction and/or abduction/external rotation with anterior/inferior instability.

Discussion and Conclusion: Patients with persistent symptoms but with MRIs interpreted as "negative" for capsulolabral pathology are not uncommon. Disparity between potential MRI accuracy for labral lesions/instability in optimal settings and what is actually delivered seems paradoxically better identified in the radiology literature than in the orthopedic literature. Blind acceptance of MRI as an infallible guide for clinical decision making is not warranted. Careful history taking and physical exam can predict treatable Kim and Stewart lesions which have been "missed" by MRI.

Poster 17

Acute Arthroscopic Repair of the Radial Ulnohumeral Ligament Following Elbow Dislocation in the High-Demand Patient

Michael J. O'Brien, MD
Felix H. Savoie III, MD

Introduction: Conservative treatment of simple elbow dislocations usually results in favorable outcomes. Residual symptoms may persist and return to full activities may take 12 weeks or longer. This scenario is challenging for the in-season athlete or professional who requires use of the arm to competently perform. Acute arthroscopic repair of the radial ulnohumeral ligament (RUHL) can potentially return these patients to activities faster. Our hypothesis was that arthroscopic repair of the RUHL is a safe, effective procedure that restores stability to the elbow and allows high-demand individuals to quickly return to work and play.

Methods: We retrospectively reviewed 14 consecutive high-demand patients who underwent this procedure. The Mayo Elbow Performance Score (MEPS) was used as the primary outcome measure. Elbow range of motion (ROM), stability and time to return to full activities were recorded.

Results: Average patient age was 25 years, mean follow-up of 30 months with minimum 6-month clinical exam. Post-operative MEPS were excellent (range 95-100) for all 14 patients. All returned to their pre-injury level of function. Average time to return to full activity in and out of a brace was 2.7 weeks and 6.6 weeks in the acute group, and 4.6 weeks and 8.9 weeks in the subacute group, respectively. Final ROM averaged -3° full extension to greater than 130° flexion. No patient reported residual instability. One post-operative complication occurred with heterotopic ossification that did not require additional surgery.

Discussion and Conclusion: Conservative management remains the gold standard for most elbow dislocations. We believe that certain high-demand patients may be candidates for more aggressive treatment. Our preliminary data reveal that this is a safe, effective procedure that restores stability to the elbow and may allow high-demand patients to return to full activities faster than conservative treatment in a brace.

Poster 18

Fluid Collections in Amputations: Prevalence and Irrelevance

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Mark D. Murphey
Jonathan A. Forsberg
Benjamin K. Potter, MD

Introduction: In the acute post-operative period, fluid collections are common in lower extremity amputations. Existing literature provides minimal guidance with regard to whether these fluid collections lead to adverse clinical outcomes. The purpose of this study was to determine the prevalence of post-operative fluid collections in post-traumatic amputations and their implications on the presence or absence of infection.

Methods: A retrospective review of 300 consecutive lower extremity amputations was performed looking for amputations which underwent advanced imaging (CT, MRI, US) after definitive closure with patients divided based on time to scan (early less than 3 months). We reviewed the clinical course with the principal outcome being a return to the operating room. We also collected data from the period of the scan to include physical exam, vitals and laboratory values. Our

primary study cohort where those patients with a documented early fluid collection.

Results: 30 (55%) of the 55 limbs scanned in the early post-operative course had fluid collections whereas only 2 (11%) of the 19 limbs scanned in the late post-operative period had fluid collections. There was no statically significant association between the presence of a fluid collection and infection in either group. However, there was a statistically significant association between early clinical concern at the extremity and return to the operating room.

Discussion and Conclusion: Fluid collections are common in combat-related amputees in the immediate post-operative period, and are significantly less prevalent in scans performed outside this period, suggesting that they decrease in size or resolve with time. If discovered incidentally on CT, the presence of a fluid collection does not seem to indicate the presence of infection, unless other, clinical signs of wound infection are present at the extremity. Advanced imaging performed in the absence wound-specific concerns is therefore of limited clinical utility in the early post-operative period following amputation revision and closure.

Poster 19

Co-Management of Elective Joint Replacement Patients Reduces Rapid Response Calls

Andrew A. Shinar, MD
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Paul Shinar
A. Alex Jahangir, MD
Elizabeth Rice, MD
April Kapu, RN

Introduction: We examined the use of standard criteria to determine which arthroplasty patients received medical consultation, and studied whether this intervention impacted the incidence of rapid response team (RRT) calls.

Methods: We compared 190 consecutive elective arthroplasties from November 2012 through March 2013 (intervention group) to a control group of 215 arthroplasties from January 2011 through June 2011. In both periods, medical consults were obtained at the discretion of the surgical team, but in the intervention group, prospective medical consults were obtained using modified criteria of Huddleston: patients with age greater than 75, with one or more major comorbid conditions, or with 2 or more less disabling comorbid conditions. One surgeon performed all surgeries, and we excluded 17 non-elective cases. For the remainder of the whole orthopaedic service, we compared hospital RRT call data for these 2 periods.

Results: RRT calls among elective arthroplasty patients decreased to 2.1% in the intervention group from 3.3% in the control group, while calls increased 304% for the remainder of the whole orthopaedic service (from 16 calls/ 1166 patients to 38 calls/ 911 patients) (p=.016). Medical consults were obtained in 55% of the intervention patients, as compared to 15% of the controls (p=.0001), and were performed earlier: 0.46 versus 1.16 days (p=.0002). ASA scores, age, BMI, and percent revision procedures did not differ (p=.22, .79, .52, and .13). Length of stay among primary arthroplasties non-significantly decreased from 3.20 to 2.96 days (p=.057). Medical consultants had seen all 4 RRT calls in the intervention group prior to the RRT, with none requiring ICU transfer. None of the 7 RRT calls had been seen by the medical consultant in the control group, and 3 required ICU transfer.

Conclusion: Routine medical consults in appropriate patients significantly reduced the rate of rapid response calls among elective arthroplasty patients.

Poster 20

Trends in Intraarticular Delivery of Corticosteroid and Hyaluronic Acid in a Privately Insured Population, 2007-2011

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R. Andrew Henderson, MD, MSc
Samuel S. Wellman, MD
Michael P. Bolognesi, MD
Richard C. Mather III, MD

Introduction: Intraarticular corticosteroid and hyaluronic acid (HA) injections represent a mainstay of treatment for osteoarthritis and other joint diseases. While several studies have examined and debated the efficacy of certain intraarticular pharmaceuticals, rates of use are not fully known.

Methods: Patients receiving intraarticular corticosteroid or HA between 2007 and 2011 were identified by CPT codes in

private insurance claims via the PearlDiver Database. This database contains all orthopaedic claims for over 20 million patients. Intraarticular drug delivery into a major joint (knee, hip, or shoulder) was identified and stratified by demographics, drug type, primary diagnosis, and physician charges.

Results: Between 2007 and 2011, 974,640 patients received intraarticular corticosteroid injections and 114,528 received HA injections. From 2007 to 2011, the number of patients receiving corticosteroids increased 20.5% from 328 to 395 per 10,000 person-years, while from 2008 to 2011, the number receiving HA rose 4.1% from 39.7 to 41.3 per 10,000 person-years. Patients age 60-64 years incurred the highest utilization, with 68.0 corticosteroid and 9.1 HA injections per 10,000 person-years in 2011. All age groups had increased corticosteroid use from 2007 to 2011, with greater variability in HA use over the same period. Independent of injection procedure charges, physician charges for corticosteroid drugs rose from $10.8 million in 2007 to $11.4 million in 2011, while HA drug charges fell from $50.0 million in 2008 to $36.9 million in 2011. The rate of post-injection septic arthritis was 5.44 per 10,000 corticosteroid and 4.05 per 10,000 HA injections.

Discussion and Conclusion: Intraarticular drug delivery is an increasingly common procedure within this privately insured population. Examined trends show increases for corticosteroids across demographic profiles and demonstrate significant variability in the use of HA in the years after approval. The cause of these trends is unknown and deserves further investigation.

Poster 21

Sacral Screw Strain in a Long Posterior Spinal Fusion Construct with Sacral Alar-Iliac (S2AI) versus Iliac Fixation

Gregory S. Van Blarcum, MD
Daniel G. Kang, MD
Ronald A. Lehman Jr., MD
Robert W. Tracey, MD
John P. Cody, MD
Khaled M. Kebaish, MD
Lawrence G. Lenke, MD

Introduction: Long instrumented posterior fusion constructs to the lumbosacral spine have a significant rate of pseudoarthrosis and S1 screw failure. With the increasing popularity of Sacral Alar-Iliac (S2AI) fixation with its purported advantages of decreased implant profile and obviating the need for a lateral offset connector, the biomechanical properties with respect to S1 screw strain remain unknown. We set out to compare the biomechanical effect of S2AI versus traditional iliac screw fixation on S1 screw strain.

Methods: Five fresh-frozen human cadaveric specimens were instrumented from L2-pelvis, maintaining all osteoligamentous structures, with bilateral pedicle screws and rod constructs. Bilateral S1 pedicles were instrumented with screws that were centrally cored out and two uniaxial strain gauges inserted at 0° and 90°. S2AI and/or iliac fixation with pedicle screws was performed to evaluate four different constructs: bilateral S1 screws (control); bilateral S2AI; bilateral iliac; hybrid (S2AI with contralateral iliac). Bilateral S1 screw microstrain was measured, and pure moment loads were applied in axial rotation (AR), flexion-extension (FE) and lateral bending (LB).

Results: Both S2AI and Iliac fixation significantly reduced sacral screw strain in FE by 58% and 67%, respectively, in AR by 35% and 41%, respectively, while no significant difference in LB for either construct. Hybrid constructs demonstrated a significant reduction in only FE, with reduction in screw strain by 56% for S2AI and 59% for iliac fixation, with no difference in AR and LB moments. There was no significant difference in screw strain for all bending moments comparing S2AI and iliac fixation. Hybrid constructs demonstrated no significant difference between S2AI and iliac fixation for all bending moments.

Discussion and Conclusion: Bilateral S2AI fixation is a biomechanically comparable alternative to traditional iliac fixation, and presents another option to achieve protection of the S1 sacral screws for long segment constructs to the pelvis.

Individual Orthopaedic Instruction/ Multimedia Education

Schedule:

Thursday, July 17, 2014	2:30pm-5:00pm
Friday, July 18, 2014	2:30pm-5:00pm
Saturday, July 19, 2014	2:15pm-4:15pm

The following AAOS DVDs are available for individual viewing at the above times.

1. **Anatomy of the Knee** (25 minutes)
   Stephen L. Brown, MD; Patrick M. Connor, MD; Donald F. D'Alessandro, MD; 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. **Surgical Dislocation and Debridement for Femoro-Acetabular Impingement** (22 minutes)
   Christopher L. Peters, MD and Jill A. Erickson, PhD

4. **Hip Resurfacing: Direct Anterior Approach** (12 minutes)
   William J. Hozack, MD; Michael M. Nogler, MD; Stefan Kreuzer, MD; and Martin Krismer, MD

5. **Imageless Navigation in Hip Resurfacing Arthroplasty** (15 minutes)
   Michael L. Swank, MD and Amy L. Hallock, MEd

6. **Basics of Computer Navigation in Total Knee Arthroplasty** (11 minutes)
   James B. Stiehl, MD

7. **Lateral Approach for Valgus Total Knee Arthroplasty** (12 minutes)
   James B. Stiehl, MD

8. **Molded Articulating Cement Spacers for Treatment of Infected Total Knee Arthroplasty** (12 minutes)
   Adolph V. Lombardi Jr., MD, FACS; Keith R. Berend, MD; and Joanne B. Adams, BFA

9. **Arthroscopic Suprascapular Nerve Release** (23 minutes)
   Laurent Lafosse, MD

10. **Open Repair of Acute and Chronic Distal Biceps Ruptures** (25 minutes)
    James Michael Bennett, MD; Thomas Lynn Mehlhoff, MD; and James Burlin Bennett, MD

11. **Arthroscopic Acetabular Labral Repair: Surgical Technique** (9 minutes)
    Marc J. Philippon, MD; Michael J. Huang, MD; Karen K. Briggs, MPH, MBA; and David A. Kuppersmith, BS

12. **Anterior Cruciate Ligament Reconstruction Using Achilles Allograft and Interference Screws** (10 minutes)
Colin G. Looney, MD and William I. Sterett, MD

13. **Osteochondral Lesion of the Talus (OLT): Technique of Osteochondral Autologous Graft Transfer** (11 minutes)
Sameh A. Labib, MD and Brett A. Sweitzer, MD

14. **Revision ACL Reconstruction Using the Anatomic Double Bundle Concept** (14 minutes)
Freddie H. Fu, MD; Nicholas J. Honkamp, MD; Wei Shen, MD, PhD; Anil S. Ranawat, MD; and Fotios Tjoumikaris, MD

15. **The Krukenberg Procedure for Children** (25 minutes)
Hugh Godfrey Watts, MD; John F. Lawrence, MD; and Joanna Patton, ROT

16. **Single Incision Direct Anterior Approach to Total Hip Arthroplasty** (13 minutes)
William J. Hozack, MD; Michael M. Nogler, MD; Javad Parvizi, MD, FRCS; Eckart Mayr, MD; and Krismer Martin, MD

17. **Medial Patellofemoral Ligament Reconstruction** (13 minutes)
Ryan E. Dobbs, MD; Patrick E. Greis, MD; and Robert T. Burks, MD

18. **Hip Arthroscopy: Operative Set-Up and Anatomically Guided Portal Placement** (8 minutes)
Allston Julius Stubbs, MD; Karen K. Briggs, MPH, MBA; and Marc J. Philippon, MD

19. **Anatomy of the Shoulder** (24 minutes)
Donald F. D'Alessandro, MD

20. **Anterolateral Approach in Minimally Invasive Total Hip Arthroplasty** (18 minutes)
Leonard Remia, MD

21. **Patient Specific Knee Design: An Evolution in Computer-Assisted Surgery** (22 minutes)
Adolph V. Lombardi Jr., MD; Keith R. Berend, MD; and Joanne B. Adams, BFA

22. **Hemiarthroplasty for a Comminuted Fracture of the Proximal Humerus** (20 minutes)
Jon J. P. Warner, MD; Darren J. Friedman, MD; Zachary R. Zimmer, BA; and Laurence D. Higgins, MD

23. **Rotator Interval Repair of the Shoulder: Biomechanics and Technique** (7 minutes)
Matthew T. Provencher, MD and Daniel J. Solomon, MD

24. **Excision of Calcaneonavicular Tarsal Coalition** (7 minutes)
Maurice Albright, MD; Brian Grottkau, MD; and Gleeson Rebello, MD

25. **Extensile Surgical Approach for the Resection of Large Tumors of the Axilla and Brachial Plexus** (9 minutes)
James C. Wittig, MD; Alex R. Vap, BA; Camilo E. Villalobos, MD; Brett L. Hayden, BA; Andrew M. Silverman, BA; and Martin M. Malawer, MD

26. **The Anterior Supine Intermuscular Approach in Primary Total Hip Arthroplasty** (18 minutes)
Keith R. Berend, MD; Adolph V. Lombardi Jr., MD; and Joanne B. Adams, BFA, CMI

27. **Robotic Arm-Assisted Unicompartmental Knee Arthroplasty: An Introductory Guide** (15 Minutes)
Christopher John Dy, MD; Kristofer Jones, MD; Samuel Arthur Taylor, MD; Anil Ranawat, MD; and Andrew D. Pearle, MD

28. **Vertical Humeral Osteotomy for the Revision of Humeral Components in Shoulder Arthroplasty** (21 minutes)
Geoffrey Van Thiel, MD; Gregory P. Nicholson, MD; James Patrick Halloran, MD; Dana Piasecki, MD; Matthew T. Provencher, MD; and Anthony A. Romeo, MD

29. **Techniques for Safe Portal Placement in the Shoulder: The Ring of Fire** (13 minutes)
Keith D. Nord, MD; Bradford A. Wall, MD; Prithviraj Chavan, MD; and William H. Garrett, BS

30. **Reconstruction of the Medial Collateral Ligament of the Elbow** (12 minutes)
James Michael Bennett, MD; Thomas Lynn Melhoff, MD; and Rodney K. Baker

31. **Reconstruction of Abductor Mechanism-Gluteus Maximus Flap Transfer** (15 minutes)
Leo Whiteside, MD and Marcel Roy, PhD

32. **Kinematic Alignment with Modified Conventional Instruments Instead of Patient-Specific Guides** (26 minutes)
Stephen Howell, MD

33. **Arthroscopic Management of Femoroacetabular Impingement** (12 minutes)
J. W. Thomas Byrd, MD

34. **Arthroscopic Suprascapular Nerve Decompression: Etiology, Diagnosis, and Surgical Technique** (21 minutes)
Sanjeev Bhatia, MD; Adam B. Yanke, MD; Neil S. Ghodadra, MD; Seth Sherman, MD; Anthony A. Romeo, MD; and Nikhil N. Verma, MD

35. **Combined Cartilage Restoration and Distal Realignment for Patellar and Trochlear Chondral Lesions** (12 minutes)
Peter Chalmers, MD; Adam B. Yanke, MD; Seth Sherman, MD; Vasili Karas, BS; and Brian Cole, MD, MBA

36. **Simple Arthroscopic Anterior Capsulo-Labral Reconstruction of the Shoulder** (17 minutes)
Stephen J. Snyder, MD and Jeffrey D. Jackson, MD

37. **Proximal Humerus Resection for Parosteal Osteosarcoma** (16 minutes)
Yvette Ho, MD; Camilo E. Villalobos, MD; and James C. Wittig, MD

38. **Biceps Tenodesis: Open Subpectoral and Arthroscopic Technique** (19 minutes)
Adam B. Yanke, MD; Peter N. Chalmers, MD; Anthony A. Romeo, MD; and Nikhil N. Verma, MD

39. **Total Shoulder Arthroplasty: Steps to Get It Right** (15 minutes)
Richard J. Hawkins, MD

40. **ACL Anatomic Single Bundle Reconstruction Technical Note and Results** (20 minutes)
Michael W. Moser, MD; Gonzalo Samitier Solis, MD; Terese L. Chmieleski, PT, PhD; and Trevor Lentz, PT

41. **Surgical Repair of Proximal Hamstring Avulsion in the Athlete** (15 minutes)
Tal S. David, MD and Gabriel L. Petruccelli, MD

42. **Removal of a Broken Intramedullary Nail and Exchange Nailing for Tibial Nonunion** (10 minutes)
Kenneth A. Egol, MD; Abiola Atanda, MD; Mathew Hamula, BA, BS; and Jason P. Hochfelder, MD

43. **Radical Resection of the Glenoid and Scapular Neck for Sarcoma and Reconstruction** (11 minutes)
Brendon J. Comer, BA; Brett L. Hayden, BA; Camilo E. Villalobos, MD; and James C. Wittig, MD

44. **Shoulder Arthrodesis: Surgical Technique** (11 minutes)
Ryan Warth, MD and Peter J. Millett, MD, MSc

45. **Approaches to the Hip: Minimally Invasive Posterolateral Total Hip Arthroplasty** (24 minutes)
Cesare Faldini, MD; Francesco Traina, MD; Mohammadreza Chehrassan, MD; Raffaele Borghi, MD; Daniele Fabbri, MD; Matteo Nanni, MD; Federico Pilla, MD; Marco Pedrini, MD; and Sandro Giannini, MD

46. **Modified Anterolateral Approach with Femoral Anterior Cortical Window for Revision Total Hip Arthroplasty** (15 minutes)
Amgad M. Haleem, MD, MSc; Morteza Meftah, MD; Brian Domingues, BA; and Stephen J. Incavo, MD

47. **Spine Scapular Non-Union ORIF Solution** (8 minutes)
Thomas W. Wright, MD and Gonzalo Samitier Solis, MD, PhD

48. **Fixation of Odontoid Fractures with an Anterior Screw: Surgical Technique** (14 minutes)
Manuel Valencia, MD; Paulina De La Fuente, MD; Selim Abara, MD; Felipe Novoa, MD, Andres Leiva, MD; and Arturo Olid, MD

49. **Partial Two-Stage Exchange for Infected Total Hip Arthroplasty** (16 minutes)
Adolph V. Lombardi Jr., MD, FACS; Timothy Ekpo, DO; Keith R. Berend, MD; Michael J. Morris, MD; and Joanne B. Adams, BFA, CMI

50. **Medial Mobile-Bearing UKA with Twin-Peg Femoral Design and Enhanced Instrumentation** (18 minutes)
Keith R. Berend, MD; Adolph V. Lombardi Jr., MD, FACS; Jason M. Hurst, MD; Michael J. Morris, MD; Joanne B. Adams, BFA, CMI; Keri L. Satterwhite; and Michael A. Sneller, BS

51. **Surgical Treatment of Spondylolisthesis by Posterolateral Arthrodesis and Instrumentation** (9 minutes)
    Antonello Montanaro, MD; Francesco Turturro, MD; Cosma Calderaro, MD; Luca Labianca, MD; Vicenzo Di Sanzo, MD, PhD; Pierpaola Rota, MD; Alessandro Carducci, MD; and Andrea Ferretti, MD

52. **Transosseous Equivalent Pectoralis Major Tendon Repair** (8 minutes)
    Kevin W. Farmer, MD and Gonzalo Samitier Solis, MD, PhD

53. **Posterolateral Corner Primary Repair And Reconstruction Case Based** (18 minutes)
    Mark D. Miller, MD; Sean Higgins; and Brian C. Werner, MD

Multimedia Financial Disclosure

Southern Orthopaedic Association has identified the option to disclose as follows.

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

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

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

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

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

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

n. No conflicts to disclose.

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

Selim Abara, MD *(n.)*
Joanne B. Adams, BFA, CMI *(n.)*
Maurice Albright, MD *(n.)*
Abiola Atanda, MD *(n.)*
Rodney K. Baker *(n.)*
James Burlin Bennett, MD *(2. Ascension Orthopedics; 3b. Ascension Orthopedics; 5. Ascension Orthopedics)*
James Michael Bennett, MD *(9. AAOS)*
Keith R. Berend, MD *(1. Biomet; 3b. Biomet; 5. Biomet, Kinamed, Pacira, Stryker; 8. Clinical Orthopaedics and Related Research, Journal of Arthroplasty, Journal of Bone and Joint Surgery – American, Orthopedics; 9. AAOS, American Association of Hip and Knee Surgeons)*
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Karen K. Briggs, MPH, MBA *(5. Ossur, Smith & Nephew, Arthrex, Inc., Siemens)*
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Tal S. David, MD *(2. Arthrex, Inc., Cayenne Medical, Inc.; 3c. Cayenne Medical, Inc., Arthrex, Inc.; 4. Cayenne Medical, Inc.; 5. KFx Medical, Inc.; 7. SLACK Inc.; 8. Orthopedics, SLACK Inc.; 9. American Orthopaedic Society for Sports Medicine, Arthroscopy Association of North America, Arthritis Foundation)*
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Ryan E. Dobbs, MD *(4. Orthopaedic Implant Company)*
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Christopher John Dy, MD *(n.)*
Kenneth A. Egol, MD *(1. Exactech, Inc.; 3b. Exactech, Inc.; 5. Synthes, OREF, OTA, OMEGA; 7. SLACK Inc., Wolters Kluwer Health - Lippincott Williams & Wilkins; 8. Journal of Orthopaedic Trauma)*
Timothy Ekpo, DO *(n.)*
Jill A. Erickson, PA-C *(n.)*
Daniele Fabbri, MD *(n.)*
Cesare Faldini, MD *(n.)*
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William H. Garrett, BS *(n.)*
Neil S. Ghodadra, MD *(n.)*
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Matthew T. Provencher, MD *(8. Arthroscopy, BMC Musculoskeletal Disorders, Knee, Orthopedics, SLACK Inc., Vindico Orthopaedic Hyperguide; 9. AAOS, AOSSM, American Shoulder and Elbow Surgeons, AANA, International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine, San Diego Shoulder Institute, SOMOS)*
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Southern Orthopaedic Association

31st Annual Meeting

July 17-19, 2014

Beaver Creek
Avon, Colorado

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Southern Orthopaedic Association

31st Annual Meeting

July 17-19, 2014

Beaver Creek
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2014 CME Credit Record
Scientific Program

Please rate by checking the box corresponding to the appropriate number.
5 = Excellent 4 = Good 3 = Satisfactory 2 = Fair 1 = Poor

Thursday, July 17, 2014

Sessions	Check if Attended	Presented objective balanced, & scientifically rigorous content	Achieved stated objectives	Satisfied my educational and/or professional needs
General Session 1	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 2	☐	*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*
General Session 3	☐	*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*
Concurrent Session 4A ☐ *or* *Concurrent Session 4B* ☐		*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*

Friday, July 18, 2014

Sessions	Check if Attended	Presented objective balanced, & scientifically rigorous content	Achieved stated objectives	Satisfied my educational and/or professional needs
General Session 5	☐	*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*
General Session 6	☐	*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*
General Session 7	☐	*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*
Concurrent Session 8A ☐ *or* *Concurrent Session 8B* ☐		*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*

Saturday, July 19, 2014

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*
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*
Symposium 6	☐	*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*
Concurrent Session 12A ☐ *or* *Concurrent Session 12B* ☐		*5 4 3 2 1*	*5 4 3 2 1*	*5 4 3 2 1*

Southern Orthopaedic Association

31st Annual Meeting

July 17-19, 2014

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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 4 CME credits available during the course of the meeting for viewing posters (or a total of 16 posters).

☐ 1	☐ 8	☐ 15
☐ 2	☐ 9	☐ 16
☐ 3	☐ 10	☐ 17
☐ 4	☐ 11	☐ 18
☐ 5	☐ 12	☐ 19
☐ 6	☐ 13	☐ 20
☐ 7	☐ 14	☐ 21

Please indicate the poster(s) you found to be most meaningful and any comments. Begin with the poster number.

Please indicate any feedback that you may have concerning other posters. Begin with the poster number.

Please indicate any comments or suggestions that you have regarding the Poster Presentations.

2014 Overall Scientific Evaluation

Your feedback is critical to program planning and future course development. Please take a few minutes to complete and return this evaluation form to the registration desk prior to departure.

Why did you choose to attend this Meeting?	High Importance	Some Importance	Little Importance	No Importance
Course Topic(s)	☐	☐	☐	☐
Learning Method(s)	☐	☐	☐	☐
Program Faculty	☐	☐	☐	☐
Location of Program	☐	☐	☐	☐
Timeliness	☐	☐	☐	☐
Obtaining CME Credit	☐	☐	☐	☐
Poster Presentations	☐	☐	☐	☐
How did we do overall?	**Excellent**	**Good**	**Fair**	**Poor**
Course Educational Objectives	☐	☐	☐	☐
Practical Application to Practice	☐	☐	☐	☐
Faculty Selection	☐	☐	☐	☐
Opportunity to Interact with Faculty	☐	☐	☐	☐
Course Program	☐	☐	☐	☐
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 Program Material	☐	☐	☐	☐
Opportunity to Ask Questions	☐	☐	☐	☐
Poster Location	☐	☐	☐	☐

How did we do on Multimedia?	Excellent	Good	Fair	Poor
Multimedia Educational Objectives	☐	☐	☐	☐
Practical Application to Practice	☐	☐	☐	☐
DVD Selection.	☐	☐	☐	☐
Multimedia Location	☐	☐	☐	☐

The program content was: ☐ **Just right** ☐ **Too Advanced** ☐ **Too basic**

How much of the content was new to you? ☐ **Almost all** ☐ **About 75%** ☐ **About 50%** ☐ **About 25%** ☐ **Almost none**

Would you recommend this meeting to colleagues? ☐ **Yes** ☐ **No**

Did you perceive industry (commercial) bias in this meeting? ☐ **Yes** ☐ **No**

If yes, describe _____

What I liked best about this meeting: _____

_____

How I would improve this meeting: _____

_____

Overall, did we deliver what you came to learn? ☐ **Yes** ☐ **No**

What did you learn from attending this meeting? List an example of something you learned that can be applied to your practice: _____

_____

_____

2015 Needs Assessment Survey

Please list any medical topics that you would like included in future programs planned by SOA.

Please list any Office Management Topics that you would like included in the program.

Future Meetings

Southern at the SEC

Sports Injury Update and Pearls 2015

The Inn at Opryland
March 12-14, 2015
Nashville, TN

32nd Annual Meeting

The Omni Grove Park Inn
July 15-18, 2015
Asheville, NC

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The Southern Orthopaedic Association is grateful for the support of its educational grantors and exhibitors. Thank you for your participation and commitment to SOA.

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LifeNet Health
Medtronic Advanced Energy
MicroPort Orthopaedics
Ortho-Preferred
ProScan Reading Services
Riverside Health System
Shukla Medical
Simbionix USA
Think Surgical
Tornier
VirtaMed AG