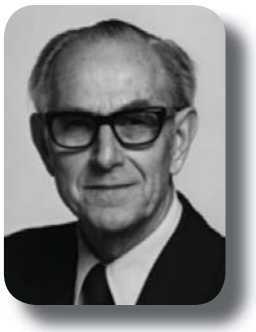
The Paul R. Lipscomb
Alumni Society Presents the

2011 Grand Rounds and Graduate Research Symposium

Thursday, June 16, 2011
Friday, June 17, 2011

with special guest speaker
Keith Bridwell, MD

Sponsored by
University of California, Davis Health System
Department of Orthopaedic Surgery



Paul R. Lipscomb, MD
Professor Emeritus
Chair 1969-1979

Michael W. Chapman, MD
Professor Emeritus
Chair 1979-1999

George T. Rab, MD
Professor
Chair 1999-2006

Paul E. Di Cesare, MD,
FACS Professor and Chair
Michael W. Chapman
Chair 2006-present

Welcome to the
2011 Paul R. Lipscomb Alumni Society
Graduate Research Symposium

This outstanding gathering is an opportunity for our department to highlight scientific and clinical research, and to reconnect with clinical faculty and alumni who have served our department over the years. Our special guest this year is Keith Bridwell.

Most importantly, this is an occasion to commemorate the graduation of thirteen exceptional men and women - four residents and nine fellows- into the ranks of orthopaedic surgery. While always a bittersweet occasion, this day validates the wonderful camaraderie and continuity of our field.

Thank you for being part of this memorable event.

Visiting Professors

1982 - Robert B. Winter, MD
1983 - Anthony Catterall, MD
1984 - Eugene E. Bleck, MD
1985 - Paul P. Griffin, MD
1986 - M. Mark Hoffer, MD
1987 - Robert B. Salter, MD
1988 - Colin F. Moseley, MD
1989 - James R. Gage, MD
1990 - James F. Kellam, MD
1991 - David S. Braddford, MD
1992 - Adrian E. Flatt, MD
1993 - Augusto Sarmiento, MD
1994 - M. Mark Hoffer, MD
1995 - James R. Andrews, MD
1996 - James R. Urbaniak, MD
1997 - Stuart L. Weinstein, MD
1998 - Robert A. Mann, MD
1999 - Joseph M. Lane, MD
2000 - Andrew J. Weiland, MD
2001 - Joel M. Matta, MD
2002 - Terry R. Trammell, MD
2003 - Kaye E. Wilkins, MD
2004 - Richard Gelberman, MD
2005 - Robert H. Hensinger, MD
2006 - James Heckman, MD
2007 - Thomas A. Einhorn, MD
2008 - Joseph A. Buckwalter, MD
2009 - Peter J. Stern, MD
2010 - Joseph Borrelli, Jr., MD
2011 - Keith Bridwell, MD

Keith Bridwell, MD

Dr. Keith Bridwell is a Professor of Orthopaedic Surgery at Washington University School of Medicine. He is the founder and Director of the Washington University (St. Louis) Spine Fellowship program, which was initiated in 1991 and to-date has trained 47 fellows, with 4 currently in training. Dr. Bridwell is Chief of Spine Surgery in the Department of Orthopaedic Surgery at Washington University School of Medicine, St. Louis, and is the Asa C. and Dorothy W. Jones Professor of Orthopaedic Surgery. He holds hospital appointments at Barnes-Jewish Hospital, St. Louis Children's Hospital, and St. Louis Shriners Hospital for Children.

Following a medical degree at Washington University Medical School in 1977, Dr. Bridwell did his orthopaedic internship and orthopaedic surgery residency at Washington University School of Medicine. In 1982, he completed a spinal deformity research fellowship at Rush Medical College, the University of Illinois, and Chicago Shriners Hospital for Children. Since that time, Dr.

Bridwell has limited his practice to spinal surgery, mostly complex spinal disorders and spinal deformity surgery. In 1985, Dr. Bridwell received board certification from the American Board of Orthopaedic Surgery.

Dr. Bridwell is an active member of the American Academy of Orthopaedic Surgeons, the North American Spine Society, the Scoliosis Research Society and the American Orthopaedic Association. He was the local host for the Scoliosis Research Society meeting in St. Louis in 1997. He has been the Chairman of the Program and the Membership Committees for the Scoliosis Research Society and has served on its Board of Directors for two separate terms. He is the Past President of the Scoliosis Research Society from 2002-2003. The Scoliosis Research Society is the leading international society for the study of spinal deformity and the oldest orthopaedic specialty society in North America.

Since 1982, Dr. Bridwell has been an active researcher in the spine field. He has contributed more than 50 chapters to medical textbooks, more than 250 articles to scientific peer-reviewed journals, and more than 450 scientific abstracts/ presentations. He is a deputy editor for Spine. Dr. Bridwell is co-editor-in-chief with Ronald L. DeWald, MD of The Textbook of Spinal Surgery, editions 1 and 2. The third edition of The Textbook of Spinal Surgery is coming fall 2011.

Faculty
University of California Davis Health System

KYRIACOS ATHANASIOU, PhD, PhM
Distinguished Professor, Orthopaedic Research

ROBERT H. ALLEN, MD
Health Sciences Associate Clinical Professor, Hand and Upper Extremity

DANIEL R. BENSON, MD
Professor Emeritus, Adult and Pediatric Spine Surgery

BLAINE CHRISTIANSEN, PhD
Assistant Professor in Residence, Orthopaedic Research Laboratory

PAUL E. DI CESARE, MD, FACS
Professor and Chair, Adult Reconstructive Surgery
Michael W. Chapman Chair

RAKESH DONTHINENI, MD
VCF, Associate Clinical Professor, Oncology

TANIA A. FERGUSON, MD
Physician Associate Diplomat, Trauma Service

DAVID P. FYHRIE, PhD
Professor and Director, Orthopaedic Research Laboratories

ERIC GIZA, MD
Assistant Professor, Chief of Foot and Ankle Service

MUNISH C. GUPTA, MD
Professor, Chief of Spinal Deformity Service
Adult and Pediatric Spine Surgery

DOMINIK R. HAUDENSCHILD, PhD
Assistant Professor in Residence, Orthopaedic Research Laboratory

ERIC O. KLINEBERG, MD
Assistant Professor, Adult and Pediatric Spine Surgery

CASSANDRA A. LEE, MD
Assistant Professor, Sports Medicine

MARK A. LEE, MD
Associate Professor, Trauma Service

KIRK J. LEWIS, MD
Health Sciences Associate Clinical Professor, Sports Medicine

RICHARD A. MARDER, MD
Health Sciences Clinical Professor, Chief of Sports Medicine

GAVIN PEREIRA, MBBS, FRCS
Assistant Professor, Adult Reconstructive Surgery

DEBRA J. POPEJOY, MD
Assistant Professor, Pediatric Orthopaedics

GEORGE T. RAB, MD
Professor, Pediatric Orthopaedics

A. HARI REDDI, PhD
Distinguished Professor, Lawrence J. Ellison Chair of Molecular Biology

ROLANDO F. ROBERTO, MD
Health Sciences Assistant Clinical Professor, Adult and Pediatric Spine Surgery

PETER B. SALAMON, MD
Physician Associate Diplomat, Pediatric Orthopaedics

ROBERT M. SZABO, MD, MPH
Professor, Chief of Hand, Upper Extremity and Microvascular Surgery

JAMES VAN DEN BOGAERDE, MD
Health Sciences Assistant Clinical Professor, Sports Medicine

PHILIP R. WOLINSKY, MD
Professor, Chief of Trauma Service

JASPER YIK, PhD
Adjunct Professor, Orthopaedic Research Laboratory

BRAD J. YOO, MD
Health Sciences Assistant Clinical Professor, Trauma Service

Faculty
Shriner's Hospital for Children Northern California

JENNETTE BOAKES, MD
VCF, Clinical Professor, Pediatrics

MICHELLE A. JAMES, MD
Clinical Professor, Chief of Orthopaedics Pediatric Surgery

JOEL LERMAN, MD
VCF, Associate Clinical Professor, Pediatrics

Program

Thursday, June 16, 2011
Grand Rounds
Cancer Center Auditorium

6:00 pm - Lecture Hall 1100
Guest Speaker - Keith Bridwell, MD
"Surgical Treatment of Pediatric and Adult Lumbar Scoliosis"

Friday, June 17, 2011
Resident and Fellow Research Presentations
Cancer Center Auditorium

8:00 AM Continental Breakfast

8:15 AM WELCOME - Department Chair, Paul Di Cesare, MD, FACS

8:20 AM Visiting Professor - Keith Bridwell, MD
"Surgical Management of High-Grade Spondylolisthesis"

9:15 AM Eddie Lo, MD
"Biomechanical comparison of locking versus non-locking constructs in an osteoporotic, segmental defect fibular fracture model"

9:30 AM Jonathan Eastman, MD
"The Retropatellar Technique for Intramedullary Nailing of Proximal Tibia Fractures"

9:45 AM Gaurav Abbi, MD
"rhBMP-2 Use in Pediatric Spinal Surgery: A review of 25 cases"

10:00 AM Tyler Nathe, MD
"Broström Repair: Strength of bone tunnel versus suture anchor and push lock construct"

10:15 AM Jeffrey Arthur, DO
"Failure of a Constrained Acetabular Liner Without Reinforcement Ring Disruption"

10:30 AM BREAK - (Photos)

10:45 AM Meryl Singer, MD
"The Use of Emergency Room Services for Hand and Forearm Fractures in the United States in 2008: Demographic Analysis and Targets for Decreasing Cost of Care"

11:00 AM Lisa Maskill, MD
"Biomechanical Analysis of Posterior Intrafocal Pinning for Extension-type Supracondylar Humerus Fractures"

11:15 AM Joshua Ellwitz, MD
"Patient and Surgeon Factors Associated With Postoperative Kyphosis After Laminoplasty"

11:30 AM Vivek Mohan, MD
"Pedicle Subtraction Osteotomies: Critical Analysis of Geometric Parameters"

11:45 AM HoHyung Lee, MD
"The Design and Testing of Patient-Specific Jigs for Targeted Glenoid Component Positioning in Total Shoulder Arthroplasty"

12:00 PM Thomas Jones, MD
"Radiographic Outcomes of Midshaft Clavicle Fractures Stabilized with Mini-Fragment Plates"

12:15 PM William Min, MD
"The clinical efficacy of compressive trans-sacral screw fixation for unstable posterior pelvic ring injuries"

12:30 PM Chukwunenye Osuji, MD
"Treatment of Distal Clavicle Fractures: A Retrospective Review"

12:45 PM Adjournment

Education
B.S. Bioengineering: University of California, San Diego

MD: UC San Diego

Gaurav Abbi, MD
Resident

Next Step
Orthopaedic Spine and Deformity Fellowship, NYU Hospital for Joint Diseases

Career Objective
Spine Surgeon

Personal Statement
Residency is truly a test of your character. It challenges your strength, mettle and compassion as a person, doctor and surgeon. To come out of surgical residency successfully means you have passed that test, an accomplishment of which I am truly proud.

Of course, I could not have completed this journey alone. I want to thank first and foremost my parents and my family. Without their encouragement, I would never have had the courage or determination to start down this path in the first place. Without their support, I never would have completed this journey.

I would also like to thank all the staff at UC Davis. The nurses, clinic staff and OR staff made the long days and long nights much more tolerable. I would of course like to thank the residents, first

those that have graduated before me. It was their guidance and patience that helped mold me into the doctor I am today. I would also like to thank the junior residents; your efforts and hard work have not gone unnoticed. I hope I have set a good example for all of you. I wish you all the best of luck.

Finally, I would like to thank all the attending staff. Though you all have very unique teaching styles, I have learned a great deal from each of you. To Drs. Gupta, Roberto and Klineberg, it was your mentorship and guidance that truly piqued my interest in spinal surgery and you all have opened the doors for my future career. I appreciate you all as great surgeons, doctors, mentors and teachers.

This path we have chosen is an arduous one and though my journey in the world of Orthopaedics is just beginning, I have confidence that my training here at UC Davis has laid a solid foundation for my future successes. Thank you.

Efficacy of Bone Morphogenetic Protein in Enhancing Fusion in Complex Pediatric Spinal Surgery

Abbi, G; Gogia, J; Wright, D; Klineberg, E; Roberto, R; Gupta, M.

Background: The use of recombinant human bone morphogenetic protein in adult spinal surgery has been well studied. However, its use has not been well-studied or reported in the pediatric population. The FDA issued a warning related to its use in patients less than eighteen years of age due to concerns over the effects of antibody formation, possibility of bony overgrowth, and reproductive toxicity to the fetus. Our study is the only the second such report to demonstrate the safety and efficacy of rhBMP-2 for use in pediatric spinal surgery.

Methods: We performed a retrospective review of three-hundred consecutive spine surgeries performed at a single institution between August 2005 and August 2008. Chart review was performed to identify demographics, procedure, and complications. Radiographic investigation of pre-operative, immediate post-operative, and final follow-up films for fusion and maintenance of correction was performed. Twenty-five patients (twenty-nine uses of BMP) met the inclusion criteria of the use of rhBMP-2. There were 12 males and 13 females, with an average age of 14 years (range 5 – 19 years). Average length of followup was 30 months (range 24-67 months). One patient moved out of state after 3 months postoperatively. Patients were evaluated at final follow-up for clinical and radiographic evidence of fusion and complications.

Results: Diagnoses varied, but included congenital kyphosis, spondylolisthesis, cervical instability, neurofibromatosis, post-traumatic deformity, and cerebral palsy. Seven of twenty-five patients had undergone previous spinal surgery, and seven of twenty-five patients were treated with anterior and posterior

surgery. Average major coronal curve preoperatively was 73° (range 45-90°), 30° postoperatively with an average loss of 3.7° (range 0-10°) at final follow-up. Average kyphosis correction was 54° (range 10-119°) with an average loss of 2.6° (range 0-7°) at final follow-up. Complications included deep infections in two patients, pseudarthroses in two patients, and unintended but asymptomatic bony overgrowth to one additional level in two patients. One complicated patient required a revision surgery with additional fixation and rhBMP-2 due to short segment fixation; this was not deemed to be a pseudoarthrosis.

Conclusions: rhBMP-2 was successfully used in pediatric spinal surgery obviating the need for iliac crest bone graft. In this short term study, the use of rhBMP-2 in twenty-four cases of pediatric spinal deformity showed no significant adverse events. Longer follow-up and more studies will be need to be performed to truly determine the long term effects of rhBMP-2 in the pediatric population.

Education
BS: University of California, Davis

MD: Pennsylvania State University, College of Medicine

Jonathan Eastman, MD
Chief Resident

Next Step
Orthopaedic Trauma Fellowship in Seattle at Harborview Medical Center

Career Objective
A long, productive, and happy career as an academic orthopaedic traumatologist with a focus on pelvic ring and acetabular trauma and reconstruction.

Spouse
Heather Eastman

Children
None, but our dog, Kaia lives better than most children.

Personal Statement
Residency has flown by and has passed in what seems like a blink of the eye. I've been fortunate to have been taught for the past 5 years from some truly outstanding physicians and clinical educators. Of course, I am biased towards the trauma staff, but we truly have great attendings in all disciplines and it's been a privilege to work with all of you. I've been even more fortunate to have developed some great friendships both inside and out of the hospital. Some of the best times I had were

over drinks, up in Tahoe, or out on the river…. couldn't ask for more. Lastly, the best thing that I was blessed to find here at UC Davis was my beautiful wife Heather. I couldn't have done it without you. You make me a better person and our life better every day.

The Retropatellar Technique for Intramedullary Nailing of Proximal Tibia Fractures

Eastman, J; Tseng, S; Lo, E; Li, CS; Yoo, B; Lee, MA

Objective: To investigate if the radiographically correct and anatomically safe starting point and an appropriate sagittal plane vector could be obtained using a retropatellar technique for proximal tibia fractures treated with an intramedullary device as well as to define the spatial relationships between major intraarticular structures of the knee and the entry site of a tibial nail inserted with a retropatellar technique.

Methods: Cadaveric study utilizing sixteen fresh frozen limbs. We performed a retropatellar approach via longitudinal quadriceps split, passed a specialized trocar through the patellofemoral joint and onto the superior aspect of the tibia. We inserted Kirschner wires into the anatomic safe zone of the tibial plateau at zero, ten, twenty, thirty, forty, and fifty degrees of knee flexion utilizing biplanar fluoroscopy. We recorded knee flexion with a goniometer as well as the entrance vector of the Kirschner wire in relation to the anterior tibial cortex. Lastly, the radiographic safe zone was again obtained. The opening reamer breached the proximal tibia and a non-reamed tibial nail was placed. Gross dissection followed. Linear distances between the nail entry site and selected intraarticular structures were obtained.

Results: There was a progressive increase in the ability to obtain the correct anatomical start site from 1/16 (6.25%) at full extension to 12/16 (75%) at fifty degrees of knee flexion ($p=0.00098$). A statistically significant decrease in the average sagittal plane entrance vector in relation to the anterior tibial cortex was found from 23.1 degrees at full extension to -0.41 degrees at fifty degrees of knee flexion ($p<0.0001$).The mean distance of the nail entry site and the medial and lateral menisci were 6.6 ⌀ 3.2 millimeters (mm) and 6.4 ⌀ 4.4 mm, respectively. The distance to the medial and lateral articular surfaces were 5.6 ⌀ 3.6 mm and 7.4 ⌀ 4.2 mm, respectively. The mean distance to the ACL footprint was 7.5 ⌀ 3.5 mm. The medial meniscus was violated in 12.5% of specimens. The lateral meniscus was never violated during the procedure. The intermeniscal ligament was violated in 81.2% of the specimens. The ACL was undisturbed in all specimens.

Conclusion: The retropatellar technique allows the radiographically defined correct start site to be localized, particularly at higher degrees of knee flexion. More favorable intramedullary nail insertion angles were possible with the retropatellar technique, particularly with

knee flexion angles greater than 20 degrees. The intermeniscal ligament and medial meniscus are at the most risk during intramedullary nailing of the tibia utilizing the retropatellar technique. Damage to the intermeniscal ligament and medial meniscus occurs more commonly with retropatellar intramedullary nailing than what is currently accepted when using the commonly accepted anatomically safe and radiographically correct start site. The clinical ramification of this remains unclear. The frequency of injury to the remainder of the intraarticular structures is comparable to traditional parapatellar techniques. Proper technique is essential in order to minimize injury to structures of the knee. The retropatellar technique demands clinical investigation to further define the prevalence of intraarticular

Education

BA Molecular & Cellular Biology: University of California, Berkeley

MD: Columbia University

Eddie Lo, MD
Resident

Next Step

Southern California Orthopedic Institute Sports Fellowship. The Carrell Clinic-Shoulder and Elbow Fellowship

Career Objective

Shoulder- sports specialist; academic or private practice.

Personal Statement

It is hard to believe how much I have achieved in the last five years. This time has certainly gone by quickly. I can still remember the day I interviewed with Drs. Lee, Roberto, Gupta, Jamali, Allen, and etc. Thank you all for giving me this opportunity. I hope I have not failed your expectations and I have certainly enjoyed working with you all. Drs. VdB, Marder, Lewis, Lee, and Szabo- thank you for your mentorship. Your influence has changed my life forever.

This is a phenomenal journey. And definitely a sentimental one. I must thank all the residents that have taught me, worked with me, and helped me. Jon, Tyler, and Gaurav- you guys are amazing co-residents and friends! I thank

you for a great 5 years. Margaret- thank you for your help throughout the year. Clinic and OR Staff- thank you for helping me when I needed it and not laugh at me when I made mistakes.

Special thanks to Dr. Mark Lee, my residency and life mentor. Your words of wisdom, guidance, and support have led me to where I am today. No words can express my gratitude to you…

Biomechanical comparison of locking versus non-locking constructs in an osteoporotic, segmental defect fibular fracture model.

Eddie Y Lo, MD; Susan S Tseng, MD; Mark A Lee, MD; Brad J Yoo, MD

Background: In the treatment of displaced distal fibular fractures, multiple treatment options are available. Studies investigating fibular fixation construct stability have involved lateral plating, screw only fixation, and locked plating. Most of these prior studies utilized a simple, length stable fracture model and a load to failure testing protocol. In this particular experiment, a segmental defect osteoporotic model is proposed, simulating a scenario in which locking constructs are hypothesized to have superior fatigue properties compared with nonlocked implants. The purpose of this study was to examine the biomechanical behavior of three distinct constructs subjected to non-destructive cyclic loading. A lateral locked plate and two separate nonlocked fixation constructs were examined.

Methods: Eighteen adult, paired cadaveric ankle specimens were used. Pretesting bone densitometry confirmed clinical osteoporosis with all ankles exhibiting a bone marrow density < 0.5 g/cm3. A segmental 1.5 cm defect was created at the suprasyndesmotic level. The specimens were randomized to one of three fracture fixation constructs; a one third tubular plate, an industry specific precontoured fibular plate with nonlocking screws (Smith and Nephew, Memphis, TN), or the same precontoured fibular plate with locking screws into the distal segment alone. The working length, defined as the distance between the two screws closest to the fracture, was similar between plates (14 mm). All plates were positioned on the lateral fibular aspect, each with four bicortical proximal screws and four unicortical distal screws, numbered 1 to 8, from proximal to distal. The tibiae of each specimen was potted in methylmethacrylate and mounted to the MTS machine via two transcalcaneal Steinman pins. With a preload of 150 N, each ankle was non-destructively loaded with an external rotation force of 0 to 2.5 N-m for 10,000 cycles. Primary outcome measure was rotational displacement (deg) of the tibiotalar joint, at 100, 2500, 5000, 7500, 10000 cycles, measured via the MTS machine. Secondary outcome measures included change in stiffness of construct (N-m/deg) and pre- and posttesting insertional torque of each of the screws. An analysis of variance was calculated for statistical analysis.

Results: At the end of 10,000 cycles, the nonlocking one-third tubular plate externally rotated 11.7°, while the nonlocking and locking precontoured plates rotated 8.6° and 10.6° ($p=0.50$). The average change in stiffness of the one third tubular plate was 0.35 Nm/deg ($p<0.001$), significantly different from the nonlocking and locking precontoured plates, 0.15 and 0.17 Nm/deg ($p=0.69$). The average loss in insertional torque in positions 1 to 4 were 33%, 41.4%, 58.3%, and 65.3%, with no differences amongst fixation constructs. The average loss in insertional torque in positions 5 to 8 for nonlocking constructs (71.9%, 69.2%, 92.4%, and 75.4%), was significantly different from that of the locking construct (15.5%, 12.2%, 9.7%, 21.4%) ($p<0.05$).

Conclusions: In this experiment, the plate type was the primary determinant affecting the stiffness of the fixation construct. The addition of locked screws contributed minimally to the construct. Regardless of the fixation constructs, cyclic loading led to similar rotational displacements. When evaluated for the stability of the plate-screw interface, there were predictable losses of distal screw purchase in osteoporotic bone, with nonlocking screws experiencing greater loss than locking screws. Taken together, this suggests that although the locked screws maintain the plate-screw stability of the construct, the locked screw will still fail at the bone-screw interface in osteoporotic bone, leading to an ineffective overall construct in resisting rotational displacement.

Clinical Relevance: In this segmental fibula model, the individual plate characteristics influence the rotational stability of the fracture; however, the locking mechanism of the fixation construct adds little to prevent angular rotation of the fibular when subjected to nondestructive cyclic loading.

Education
BS Chemistry: University of Washington

MD: University of Washington

Tyler Nathe, MD
Chief Resident

Next Step
Sports Medicine Fellowship at UC Davis

Career Objective
To always provide the best quality of care to my patients and be respected by my peers.

Spouse
Sharonjeet Sangha M.D.

Children
Kian Singh Nathe

Personal Statement
It has been a great five years, more than I could have hoped for. I would like to thank all of the attendings that have spent time teaching me. Truly, you have given all of the residents a great gift in your dedication to teaching. We are forever in debt to you. Thank you for your patience and holding us to such a high standard. It might be painful at times, but it makes us better physicians and our future patients are the ones that benefit.

Thank you residents, past and present, for your friendship and camaraderie. We learn so much from each other. I only hope that I have been able to pass on 10% of what you have all given to me.
Lastly, thank you to my family. Thank you Mom and Dad for your love, guidance, mentorship, and friendship. As the residents can attest, I was probably a major pain but you persevered and here I am. Thank you to my brothers and sisters for holding me to high expectations. Thank you to my mother and father in law for the huge sacrifice you have made to help my wife and I raise our beautiful son. And thank you to my beautiful wife Sharon for everything you have done for me. You have supported my aspirations since we met in medical school and have always been a huge source of support. You have made sacrifices so that I could pursue my dreams and I could not have done it without you.

Broström Repair: Strength of bone tunnel versus suture anchor and push lock construct

Tyler Nathe M.D., Matthew Anderson M.S., Valentina Campanelli B.S., Ryan Nathe B.S., Eric Giza M.D.

Background: Sprains of the lateral ligaments of the ankle are common in sport. They account for up to 45% of basketball injuries and 17-20% of soccer injuries. They also are the most common cause of acute injury in volleyball and the leading cause for time loss in the NFL. The operative treatment of mechanical ankle instability is indicated for patients who have had multiple sprains and have continued episodes of instability despite bracing and rehabilitation. Anatomic reconstruction has been shown to have improved outcomes and return to sport as compared to non anatomic reconstruction.

Hypothesis: The use of 2 suture anchors and a push lock anchor is equal to 2 bone tunnels in strength to failure for anatomic Broström repair.

Study Design: 7 matched pairs of human cadaver ankles were used for an anatomic lateral ligament repair. A bone tunnel construct was randomly chosen for one side and the opposite side was repaired using a suture anchor and pushlock construct. The ankles were tested for ultimate load to failure.

Methods: 7 matched pairs of human cadaver ankles were dissected free of skin, muscle, and tendon. The calaneofibular (CFL) ligament and anterior talofibular (ATFL) ligament were incised from their origin on the fibula. In the bone tunnel group, a bone tunnel was made starting from 0.5 cm anterior to the distal tip of the fibula and another was made 1.5 cm anterior to this to replicate the origin of the CFL and ATFL. The bone tunnels were drilled proximal from their starting sites and made to measure 1 cm long by 2.4 mm diameter. A #2 fiberwire suture was placed into the CFL and a separate suture into the ATFL in a running Krackow fashion with a total of 4 locking loops and then tied thru the bone tunnels with a surgeon knot and 3 reverse half hitches over alternating posts (RHAP's). In the suture anchor group, one 2.4 cm x 1.8 mm anchor was placed at the same position as each of the bone tunnel origins. The same running Krackow was placed in the CFL and the ATFL and the same knots were used. Then one limb from each suture anchor was placed thru the periosteum in a horizontal mattress fashion and placed into the bone with a 1 cm x 2 mm push lock 2.1 cm proximal to the CFL at a 40 degree angle. The tibia and fibula and calcaneus were potted with methylmethacrylate with the ankles in 15 degrees internal rotation and 20 degrees of plantarflexion. The ligaments were tested in torsion with an instrom machine to failure. Torque to failure, degrees to failure, modulus, and initial stiffness were measured. We performed a matched pair analysis. An a priori power analysis of 0.8 demonstrated 6 pairs needed to show a difference of 30% with a 15% standard error at a significance level, alpha, 0.05

Results: There was a trend towards increased torque to failure and initial stiffness in the suture anchor group, but this was not statistically different. There was no difference in the degrees to failure and modulus. A post hoc power analysis of torque to failure showed a power of .89 with 7 samples. Power for initial stiffness was .97 with 7 samples. 11 out of 14 specimen failed at either the suture anchor or the bone tunnel.

Conclusions: There is no difference in strength for a suture anchor and push lock construct as compared to a bone tunnel construct for an anatomical repair of the lateral ligaments of the ankle.

Clinical Relevance: It is the discretion of the performing surgeon based on preference, ease of use, and cost profile to choose either of these constructs for anatomic repair of the lateral ligaments of the ankle. The suture repair at the ligament was significantly strong such that the majority of ankles failed at the bone interface.

Education
BA Kinesiology:
University of Colorado at Boulder
MD: Philadelphia College of Osteopathic Medicine
Residency: St. Vincent Mercy Medical Center

Jeffrey Arthur, DO
Joint Fellow

Next Step
Start career as Total Joint Orthopedic Surgeon with Colorado Orthopedic Consultants in Denver, CO.

Career Objective
Be an advocate for my patients and always strive to provide superior care.

Spouse
Suesan Arthur

Children
Brayden Alexander Arthur

Personal Statement
To get to this juncture in my career I owe much to all that helped me along the way. First and foremost my wife and family for all their support and sacrifice. I know I would not be here without them. I appreciate and want to thank specifically Dr. Di Cesare and Dr. Pereira for their dedication and patience in allowing both the residents and myself to learn and progress in an environment that encourages patient care and attention to detail. The time and education they provide us with demonstrates their passion for the profession of orthopedics and particularly total joint arthroplasty. UC Davis has been a great experience and all the faculty and team members have been exemplary. Thank you.

Failure of a Constrained Acetabular Liner Without Reinforcement Ring Disruption

Jeffrey Arthur, D.O.
Paul E. Di Cesare, M.D.

The reported incidence of hip dislocation varies from 0.04% for primary THA to as high as 25% in revision THA. If addressed early in the postoperative course, many dislocations can be treated without surgery. Closed reduction is successful more than 60% of the time especially if the components are properly oriented, but in cases characterized by recurrent instability, surgical intervention is often required. Constrained acetabular liners are one option for patients with recurrent instability.

Failure rates for constrained liners have been reported from 4% to 29%. Failures have been reported at various interfaces including the acetabular shell from the bone surface, the constrained liner from the shell, the locking mechanism (breakage or disengagement), and dissociation at head-neck trunion. All dissociations not attributed to excessive constraint or improper technique have occurred secondary to breakage of the locking ring. This article presents the first case that we are aware of a dislocation of the head from a Pinnacle ES c constrained liner (DePuy Orthopaedics, Warsaw, Indiana), without disruption of the locking ring.

Case Report: A 55-year-old woman with a history of multiple traumas to her right hip which included a femoral neck fracture and subtrochanteric fracture treated with open reduction and percutaneous pinning and dynamic hip screw, respectively. She went on to develop a nonunion and underwent medial displacement osteotomy and ORIF. She developed severe arthritis as well as a greater trochanteric non-union for which she underwent THA for the pain and arthritis and ORIF for greater trochanteric non-union. Four months later patient had a dislocation from a standing height fall. Hip was relocated by closed methods. Four months later she re-dislocated and was revised to a Depuy Pinnacle ES c constrained liner (DePuy Orthopaedics, Warsaw, Indiana). In the following two months patient dislocated with the constrained liner intact. Intraoperatively the uncemented femoral and acetabular components were well fixed and in good alignment. The femoral head (28 mm) was securely fixed to neck. The constrained liner was engaged securely into cup and appeared undamaged with no evidence of abnormal wear. The titanium locking ring remained engaged to constrained liner. At this point, revision to a new DePuy ES 50 mm lipped constrained acetabular liner was impacted into the well-fixed 50 mm Pinnacle cup. At the time of this report patient is doing well and has had no further complications.

Education
BS Chemistry and Biology: Ashland University
MD: Medical College of Wisconsin Milwaukee
Residency: Michigan State University, KCMS

Joshua Ellwitz, MD
Spine Fellow

Next Step
Private Practice Health Care Midwest
Kalamazoo, MI

Career Objective
Provide the best possible care for my patients and to help educate the orthopaedic residents.

Spouse
Rebekah Ellwitz

Children
Liam Ellwitz

Personal Statement
I would like to thank Dr Gupta, Dr Roberto, Dr Klineberg, and Dr Benson for the time they have invested in making me the spine surgeon I have become. I also would like to thank them for their guidance and all the future advice that I am sure I will be asking for. I would also like to thank the residents, it has been my pleasure working with each of you and I hope you have learned as much from me as I have from you. Finally, thank you to the office and clinic staff that have been extremely helpful throughout this year.

Patient and Surgeon Factors Associated With Postoperative Kyphosis After Laminoplasty

Joshua P Ellwitz, MD; Rolando Roberto, MD; Munish Gupta, MD; Vivek Mohan, MD; Eric Klineberg, MD

Introduction: Expansive cervical laminoplasty began its evolution in the 1970's in Japan for the treatment of cervical spondylotic myelopathy secondary to Ossification of Posterior Longitudinal Ligament (OPLL) or cervical spondylosis. The theoretic advantages of laminoplasty include avoidance of postlaminectomy instability with preservation of cervical ROM.

It has also been established in the literature that preoperative kyphotic deformity is a risk for poor surgical outcome and neurologic recovery. Many authors have made modifications to the original surgical technique to help prevent postoperative kyphosis. We hypothesize that meticulous preservation of the interspinous ligaments may help prevent iatrogenic kyphosis.

Methods: A retrospective review of patients who underwent laminoplasty from 2003 and January 2011 at UC-Davis Medical Center. Patients who had simultaneous or staged anterior fusion in addition to laminoplasty were excluded. Additional exclusion criteria were inadequate pre-op or 3 month post-op radiographs. Cervical lordosis was measured on pre-operative, 3 month post-operative, and 1 year post-operative x-rays. Additional data collected include patient age, surgeon performing the procedure, and pre/post-operative Nurick scores. There were technical differences which were surgeon dependent, illustrated in Table 1. Statistical analysis was performed.

Results: 57 subjects met inclusion criteria and have pre-surgery and 3 month post surgery cervical radiographs. Of the 57 subjects, 32 also have post-surgery radiographs at 12 months. The average age of the subjects was 58.4 years (SD=13.3), and the average pre-surgery Nurick score was 1.7 (SZD=1.5). There were three surgical techniques used: Surgeon 1 (n = 21), Surgeon 2 (n = 15), and Surgeon 3 (n = 21).

The average pre-surgery cervical lordosis measure was 8.4 (SD = 11.9), the average cervical lordosis measure at 3 months was 4.0 (SD = 13.2), and the average cervical lordosis measure at 12 months was 4.8 (SD = 15.2). The average change in cervical lordosis measures from pre-surgery to 3 months post surgery was –4.4 (SD = 9.7) and the average additional change in cervical lordosis measures from 3 months to 12 months post-surgery was –0.38 (SD = 5.8). Changes in alignment by surgeon are displayed table 2.

Conclusions: Preventing kyphosis after laminoplasty allows decompression of the spinal cord by allowing it to float posterior due to the enlarged spinal canal. Suda et al. report decreased surgical outcomes when cervical kyphosis is greater than 13 degrees without cord

signal change and greater than 5 degrees when cord signal change is present. Our study demonstrates that the use of a plate for stabilization and meticulous preservation of the interspinous ligaments limits postoperative kyphosis. Additionally, the best predictor of postoperative sagittal alignment is preoperative sagittal alignment and the change in alignment is independent of the preoperative alignment.

Education

BS: North Georgia College and State University
MD: Medical College of Georgia
Residency: University of Wisconsin

Thomas Jones, MD
Trauma Fellow

Next Step

Joining Premier Orthopedic Specialists in Columbia, SC

Career Objective

To become a world-class orthopedic traumatologist, in regards to clinical judgement and technical skill and be a teacher of those skills to future orthopedic surgeons

Personal Statement

I would like to sincerely thank Dr's Wolinsky, Lee, Ferguson, and Yoo for the interest they have taken in my education as an orthopedic trauma surgeon. Their patience and support has made this a special year for me. The knowledge and skills they have imparted upon me during my time at UC Davis have made me a better surgeon and will serve me well in my career. I look forward to sharing what I've learned here with future orthopedic surgeons.

Radiographic Outcomes of Midshaft Clavicle Fractures Stabilized with Mini-Fragment Plates

Authors: Daemeon Nicolaou, Sheldon Coleman, Thomas Jones, Mark Lee

Clavicle fractures are relatively common injuries with an incidence of 2.6 % of all fractures. They most commonly occur in young patients, and approximately 80 % involve the middle third of the clavicle. A recent study of middle third clavicle fractures demonstrated non-union rates as high as 15% when treated non-operatively. A recent trend of increasing operative treatment of middle third fractures is supported by evidence demonstrating good early patient satisfaction and return to function compared to nonoperative treatment. Several fixation methods have been described with the small fragment plate fixation being most common. Our approach to fixation has evolved to the use of smaller caliber implants, commonly utilizing single or double mini-fragment plates following a philosophy that favors selection of the smallest osteosynthetic device that can provide adequate stability. At UC Davis, we have significant experience with osteosynthesis of displaced midshaft clavicle fractures with 2.7 mm limited contact dynamic compression plates (LC-DCP). We believe that decreased implant size allows for a greater screw density, easy contouring for custom fit of the complex bony anatomy of the clavicle, and less local soft tissue irritation leading to lower rates of hardware removal. For those patients that elect for hardware removal, the use smaller diameter 2.7 mm screws may lead to a lower refracture rate.

The specific aim of this project is to evaluate the radiographic outcomes of osteosynthesis of displaced midshaft clavicle fractures using mini-fragment plates. Our hypothesis is that this technique will yield high union rates, low hardware failure rates, low rates of symptomatic hardware, and minimal risk of refracture after hardware removal.

This study is an IRB approved retrospective, single center review performed at a level one trauma center of patients undergoing ORIF of displaced midshaft clavicle fractures with a 2.7 mm LC-DC plate. Subjects were identified based on ICD-9 and CPT codes for midshaft clavicle fractures undergoing ORIF. Patients were excluded based on the following criteria: open fractures, active infection, patients less than 20 and older than 55 years of age, and less than 3 months follow-up from date of surgery. Patients meeting our inclusion criteria will be evaluated for evidence and timing of radiographic union.

Education
BS Biochemistry: UC Berkeley
MD & Graduate School: UCLA
Residency: Cleveland Clinic
Joint Reconstruction Fellowship: Stanford

HoHyung Lee, MD
Sports Fellow

Next Step
Kaiser Permanente, Fontana, CA

Career Objective
My career objectives include delivering high quality care to my patients, keeping up to date on orthopaedic knowledge and learning how to incorporate new findings into my practice.

Children
Andrew Lee (5 yo)
Lauren Lee (3 yo)

Personal Statement
Interestingly, the latin root for the word, 'doctor', is 'docere', which means to teach.

I feel very fortunate to have had so many excellent teachers during different portions of my training. This year has been another example of my continuing fortune in my educational experience. All of my mentors this year have been wonderful role models who serve as examples of successes at various stages in their career. In addition to their motivational examples as physicians, they also demonstrate a level of compassion to their patients and their co-workers that inspires those around them to also serve accordingly. Thank you Dr. Marder, Dr. Lewis, Dr. Van den Bogaerde and Dr. Lee!

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

James Van Den Bogaerde, Scott Porter, Ho H. Lee

Proper implant positioning and soft tissue balancing are important in total shoulder arthroplasty for function and implant survival. Incorrect positioning of the glenoid component may lead to glenohumeral instability, impingement of the components, perforation of the glenoid vault with the prosthetic glenoid pegs and early loosening and failure of the glenoid component from eccentric loading.

Pre-operative assessment of glenohumeral anatomy is critical for predicting adjustments that may be needed during glenoid component placement. However, even with pre-operative imaging, intra-operative placement of the glenoid component can still be difficult, especially if there is eccentric glenoid wear from degenerative changes. Anatomic and surgical landmarks for the glenoid to assess version include the coracoid, acromial border, scapular spine and the medial border of the scapula; the position of the scapula and therefore, the glenoid orientation,

is extremely difficult to assess on the operating room table. Jigs which would allow for correct positioning of the guide pin which dictates the version and inclination of glenoid reaming, and therefore glenoid component placement, would help in correct glenoid component positioning. The goal of this project is to generate patient specific glenoid targeting jigs based on pre-operative CT reconstructions and to determine if they are capable of reproducibly placing glenoid components in a pre-operative, surgeon-specified position, inclination and version. If we are able to confirm their accuracy and reproducibility, then they could potentially be tremendous tools aiding the surgeon in glenoid component placement, especially in the context of glenoids with eccentric degenerative wear or bone loss.

Our initial pilot study involves obtaining pre-operative CT images and reconstructions of cadaveric shoulders. Based on these CT scans, we will first determine the desired entry point and angulation of the glenoid targeting pin. Once this is determined, we will design low profile, polymer-based patient specific jigs which "hug" the glenoid face and rim and also have a central targeting hole for guidance of the targeting pin.

Once these jigs are obtained for a specific cadaveric sample, surgery will be performed on the cadavers using these jigs, and the glenoid component will be cemented into place. Repeat CT scans will be performed on these post-surgical shoulders, and the final component position, version and inclination will be compared with the pre-operative intended position, version and inclination. To recreate a scenario where there is severe posterior glenoid wear, as in Walch B or C arthritic shoulders, we will ream the posterior glenoid of some of the cadaveric shoulders prior to the initial CT scan. These shoulders will then be processed in a similar fashion to the other shoulders. We will once more compare the pre-operative intended glenoid position and the post-operative glenoid placement.

These pilot studies will help establish whether or not these jigs have potential to be of benefit for the surgeon. If useful, further experiments can be carried out to compare glenoid component placement in shoulders that are operated on with these jigs and without.

Lisa Maskill, MD
Pediatrics Fellow

Education:
BS Biomedical Chemistry & Business Administration: Oral Roberts University
MD: Southern Illinois University
Residency: Michigan State University/Grand Rapids Medical Education Partners

Next Step
- Helen DeVos Children's Hospital
- Division of Pediatric Orthopaedic Surgery, Grand Rapids, Michigan
Assistant Professor of Orthopaedic Surgery, Michigan State University

Spouse
John Maskill

Personal Statement
I would like to thank all of the staff and faculty members of Shriners Hospital of Northern California and the University of California Davis Department of Orthopaedic Surgery who served as such outstanding role models and dedicated so much of their time to providing excellent teaching, guidance, and support for me during this past year. The education and experience that I received during my fellowship will be invaluable to me as I return to Michigan to begin my career as a pediatric orthopaedic surgeon and to assist with the development of a pediatric upper extremity care center providing care for children with brachial plexus birth palsy and congenital hand differences.

Biomechanical Analysis of Posterior Intrafocal Pinning for Extension-type Supracondylar Humerus Fractures

Debra Popejoy, MD; Lisa Maskill, MD

Fractures of the distal humerus are common injuries in children. Many children must receive treatment for these fractures in smaller, community hospitals. It is therefore imperative to continually seek to improve techniques for treatment of these fractures so these children may be treated in a safer, timelier, and more effective manner. Standard pin configurations used for the treatment of humerus fractures are associated with complications, and thus a new technique utilizing a novel pin configuration has recently been proposed. While more standard pinning configurations have been tested clinically and biomechanically, no testing has yet been performed for this proposed technique.

We proposed to perform biomechanical testing on synthetic composite humerii in order to compare the strength, stiffness, and torsional resistance of standard pinning configurations with that of the newly proposed intrafocal pin configuration. Data obtained from biomechanical testing can provide evidence to support the use of this technique as a safe, viable, and reproducible alternative in the treatment of supracondylar humerus fractures in children.

Similar to previously performed biomechanical studies on standard pin configurations, we planned to osteotomize

third-generation synthetic composite humerii at the level of the coronoid and olecranon fossa to simulate extension type supracondylar fractures and then reduce and stabilize the fractures with Kirschner wires in varied pin configurations, including three standard pin configurations (three divergent lateral pins, two divergent lateral pins with one medial pin, and two crossed pins) and the proposed intrafocal pin configuration. The humerii can then each be placed sequentially onto a loading frame, in order to test the stiffness of the various constructs in extension, internal and external rotations, and with varus and valgus stresses. Analysis of variance can then be carried out in order to compare construct stiffness in all modes of testing, according to both pin position and testing sequence. Analysis of the extension, varus, valgus, and torsional resistances will provide biomechanical evidence to compare to previous studies as well as support the use or disuse of the newly proposed pin configuration.

Education

BS Biology: University of Pennsylvania
MD: New Jersey Medical School
Residency: NYU Hospital for Joint Diseases

William Min, MD
Trauma Fellow

Next Step

- AO North America Jack McDaniel Memorial AO Fellowship
- Assistant Professor, Division of Orthopaedic Surgery, University of Alabama at Birmingham.

Career Objective

Become actively involved in an academic clinical practice, focusing on Orthopaedic traumatology, resident and fellow education, and research.

Personal Statement

I am very grateful for the guidance, education, and support that I have received from everyone at the University of California, Davis Medical Center. The faculty members have been tremendously supportive of my future career aspirations, and I thank them for their mentorship. In particular, I also want to thank all of the residents for their patience and hard work in making this year so rewarding and educational.

The clinical efficacy of compressive trans-sacral screw fixation for unstable posterior pelvic ring injuries

William Min, MD MS MBA, Mark A. Lee, MD, Tania A. Ferguson, MD

The optimal fixation construct utilized for unstable posterior pelvic ring injuries has yet to be clearly elucidated. An earlier biomechanical study from our institution has found that trans-sacral (TS) screw fixation provides improved construct stability over iliosacral screw fixation at one level. We hypothesized that a protocol of anatomic reduction, compression, and TS screw fixation would improve stability of fixation, and that TS screw fixation did not cause detectable neurovascular injuries.

We reviewed our database of all patients treated with our fixation protocol with a minimum follow-up of 6 months. Post-operative pelvic radiographs were assessed for radiographic healing, fixation failure, and loss of reduction at the immediate, 6-week, 3-month, and 6-month post-operative intervals. Medical records were reviewed for changes in the neurological exam after surgical management of the pelvic ring injury.

In our analysis, 50 patients treated with 55 TS screws met inclusion criteria. Thirty-five (70.0%) of these patients had Zone II sacral fractures, 19 (38.0%) had sacroiliac fracture/dislocations, and 4 (8.0%) had spinopelvic dissociation. Thirty-seven screws were placed through the S1 body, and 18 were placed through S2. Nine patients were documented to have pre-operative nerve injuries, but no patients had new neurological deficits after reduction and fixation. Two patients suffered post-operative displacements. One patient had a combined injury pattern demonstrating cranial displacement, flexion, and internal rotation through a zone II sacral fracture. Though the cranial reduction was maintained, flexion and internal rotation of 5 degrees over a retrograde ramus screw was observed at the 6-week radiograph and the patient healed in this position. The second patient had spinopelvic dissociation with gluteal necrosis and massive soft tissue injury. She was stabilized with anterior symphyseal plating, spinopelvic fixation, and compression via TS S1 screw. A severe infection developed requiring removal of the spinopelvic fixation. The TS screw subsequently failed by pullout, resulting in complete hemi-pelvic displacement and an infected nonunion of the sacrum.

From our study, we found that anatomic compression and TS screw fixation provided excellent stability and maintenance of reduction in patients with unstable posterior pelvic ring injuries. Though the placement of an intramedullary screw traversing the sacrum inherently increases the risk of neurological encroachment, we did not observe any iatrogenic neurological deficits with TS screw placement. Furthermore, the compression of Zone II sacral fractures was not associated with neurologic injury.

Vivek Mohan, MD
Spine Fellow

Education

BS Biological Engineering: Cornell University
MD: University of Illinois at Chicago
Residency: University of Illinois at Chicago

Next Step

- Private Practice: Complete
- Orthopaedic Care, Lincolnshire, IL
- Advocate Condell Medical Center
- NorthShore University Highland Park Hospital. Highland Park, IL

Career Objective

After completing my training, I will provide spine care for my community while also teaching and pursuing my own research interests. To follow in the footsteps of my mentors, I also hope to someday provide and teach advanced spine care in developing regions of the world.

Spouse

Soundarya Chandran

Personal Statement

My experience at UC Davis has surpassed all my expectations. I would like to thank everyone in the Department of Orthopaedics, including the faculty for continually challenging our knowledge and skills, the staff for their diligence in dealing with my paperwork and the residents for letting me sleep at night. My mentors in the Spine Surgery division have worked hard and spent many extra hours to support my educational and research goals. But what my mentors have taught me this past year goes far beyond a clinical or academic setting. They have taught me that a successful practice of medicine not only involves utilizing one's knowledge and technical proficiencies but applying those skills judiciously, compassionately and ethically. One day, I hope to say that I have achieved those goals and pass it on to a future generation of orthopaedic surgeons.

Pedicle Subtraction Osteotomies: Critical Analysis of Geometric Parameters.

Vivek Mohan MD MS1, Tim O. Galan BS, Lalita Gupta, Eric O. Klineberg MD1, Rolando F. Roberto MD1, Joshua C. Ellwitz MD1, Munish C. Gupta MD1.

Abstract: Restoring sagittal balance remains a challenging problem in spinal deformity surgery. Pedicle subtraction osteotomies (PSO) are a commonly used technique in correcting sagittal plane deformities. The complexity of the surgery is increased by the fact that most are revisions of previous instrumented spinal fusions. Patient satisfaction remains high even with the long duration of the surgery and recovery time with the higher risk of significant complications. Rose et al. have described a computational model to predict a successful overall global balance by summing up individual postoperative measurements: if the Thoracic Kyphosis + Pelvic

Incidence – Lumbar Lordosis ≤ 45, the outcome is likely to be successful two years after a PSO.

A retrospective review of 30 consecutive patients who underwent a PSO by a single surgeon was performed. The lumbar lordosis improved from 19° preoperatively (SD=18.7, Min= -31°, Max= 48°) to 54° postoperatively (SD=12.5, Min=25°, Max=75°). The average thoracic kyphosis changed from 36° preoperatively (SD=14°; Min=0, Max=109°) to 55° postoperatively (SD=15; Min=25°, Max=91°). The average C7 plumb line improved from 14.4 cm preoperatively (SD=6.4, Min=2, Max=24.2) to 6.0cm postoperatively (SD =5.5, Min=-4.5, Max=19.2). Of all the geometric parameters measured, only the Pelvic Incidence did not have a significant change (p-value=0.72), also similar to Rose's findings.

We describe the sum of the pelvic incidence and thoracic kyphosis minus the lumbar lordosis delineated by Rose et al, as the global sagittal sum (GSS). The postoperative C7 plumb line was significantly correlated to the GSS. Since anterior lumbar fusions at L5-S1 produced angular correction, the change in lumbar lordosis did not correlate with the PSO angle postoperatively (P-value= 0.39; R2=0.03). Although our study had a significant change in thoracic kyphosis, the thoracic kyphosis did not significantly correlate with the change in sagittal balance (p-value = 0.12). We found a significant correlation between the C7-plumb line and the GSS (p-value= 0.029; R= 0.59) but no significant correlation between the GSS and C2-femoral head gravity line (p-value= 0.715), which we suspect is due to variation in cervical kyphosis. From our linear regression analysis, we developed a simple equation to estimate the overall change in the C7-plumb line, or sagittal vertical axis (SVA). Assuming that the lumbar lordosis was being corrected to improve the SVA, approximately 20% of the change in lumbar lordosis is equal to the change in SVA (P-value < 0.0001). Represented mathematically, $\Delta SVA\ (cm) \approx -0.2 \times \Delta LL$ (degrees).

Education

BS Biochemistry: University of Texas
MD: Baylor College
Residency: Orthopaedic Surgery, The University of California Los Angeles Medical Center

Chukwunenye Osuji, MD

Trauma Fellow

Next Step

Orthopaedic Trauma – Midwest Orthopaedics Center, Peoria Illinois.

Career Objective

Treat patients who suffer from acute muscoloskeletal injuries and complications from previously treated musculoskeletal injuries.

Spouse

Valerie Osuji

Children

Noah Kamalu Osuji

Personal Statement

My interest and enthusiasm for orthopaedic trauma has steadily grown and continues to grow. It has been a privilege to spend a year at the University of California Davis Medical Center. Due to the daily interaction with the trauma faculty my approach to orthopaedic trauma has become more systematic and sophisticated. This will be the foundation upon which I build my career. The fellowship cycle will continue anew at UC Davis, but the faculty here has left a favorable and indelible impression on my memory.

Treatment of Distal Clavicle Fractures: A Retrospective Review

Chukwunenye Osuji, M.D.;
Mark Lee, M.D.

There is a high nonunion rate with nonoperative treatment of distal clavicle fractures. It is difficult to determine which fractures will result in nonunion and what percentage of nonunions will be sufficiently symptomatic to require surgical stabilization. Previous studies concerning distal clavicle fractures have conflicting results, with some advocating early internal fixation and others nonoperative treatment. No prior studies have stratified outcome based on amount of initial fracture displacement.

We present a retrospective review of the treatment of distal clavicle fractures at a level 1 trauma center. 94 charts were reviewed with treatment period spanning from July 2006 to January 2011. 29 charts matched the inclusion criteria. Inclusion criteria include age greater than or equal to 18 years old, distal third clavicle fracture, and adequate clinical followup.

24/29 individuals initially received nonoperative treatment. The average initial displacement of those receiving nonoperative treatment was 7.4 mm. There was a 25 % nonunion rate with nonoperative treatment. 50% of those who progressed to nonunion with nonoperative treatment eventually required surgical stabilization. As a whole, 17 % of those initially receiving nonoperative treatment eventually

required surgical stabilization. Of those treated nonoperatively, the average initial displacement of those proceeding to union and those resulting in nonunion were similar (7.6 mm vs 6.0 mm, respectively). There was a 17 % complication rate with nonoperative treatment. These complications include nonunion requiring surgical stabilization, erosion of bone fragment through skin requiring operative debridment and stabilization, further significant displacement of fracture fragments requiring surgical stabilization. All individuals with symptomatic nonunions requiring surgical stabilization were eventually satisfied with their outcome. 20 % of individuals treated nonoperatively throughout their entire course complained of residual discomfort at the fracture site, however, that was not sufficiently bothersome to require operative intervention. The average initial fracture displacement of those requiring surgery after failed nonoperative treatment was 11.6 mm. Excluding those converting to operative treatment, the average fracture displacement of individuals treated nonoperatively was 6.5 mm. 9/29 individuals received surgical treatment. 4/9 were from complications of nonoperative treatment. 5/9 received surgery as the initial primary management. The average initial fracture displacement of those receiving primary surgical treatment was 25.3 mm. All 9 fractures treated surgically united. 40 % (2/5) of primary surgical patients had complications. These were hematoma requiring surgical debridment and fracture through the distal screw hole after removal of a hook plate. This fracture later healed with use of a bone stimulator. 22 % of all surgically treated patients complained of residual discomfort, however, none wished for further intervention.

An initial trial of nonoperative treatment is appropriate for minimally displaced distal clavicle fractures. Nonunion and the eventual need for surgical stabilization does not preclude a good outcome. Significantly displaced distal clavicle fractures can be treated initially with surgical stabilization although the complication rate can be high. 11.6 mm may be considered the threshold displacement for operative treatment of distal clavicle fractures.

Education
BSN: University of Arizona
MD: University of Arizona
Residency: Plastic Surgery, UCSF
Fellowships: Microsurgery, UCSF
Hand Surgery, UCD

Meryl Singer, MD
Hand Fellow

Next Step
Marin, CA

Career Objective
Hand and Reconstructive Microsurgery

Spouse
Charlie Livermore

Children
Chloe and Bijou- Chihuahuas

Personal Statement
The end of fellowship is an exciting time-finally heading out into the world of medicine and surgery. We have all worked hard to get to this place and I would especially like to thank Charlie and the pups for their unwavering support. I also want to thank my faculty for their teaching and guidance along the way.

The Use of Emergency Room Services for Hand and Forearm Fractures in the United States in 2008: Demographic Analysis and Targets for Decreasing Cost of Care

M. Singer, MD, S. Kim, PhD, R. Szabo, MD, MPH

Hypothesis: We hypothesize that there may be overuse of Emergency Room (ER) care for hand and forearm fractures that are both preventable and/or that could be treated in the less costly outpatient setting. Analysis of the demographic features of patients presenting to the ER with these fractures can be a first step in advocating policies aimed at fracture prevention and for the redirection of hand and forearm fracture care to the outpatient setting.

Methods: We analyzed the Nationwide Emergency Department Sample (NEDS) database collected by the Agency for Health Research and Quality (AHRQ). To produce a nationally representative estimate, probability samples of over 28 million ER visits were selected in 2008. This sample size constitutes nearly 20% of the 125 million total ER visits in the United States in 2008. Cases were identified using the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) diagnostic codes 813.0-817.1, and patient demographics and injury cause were evaluated.

Results: In 2008, nearly 1.7 million visits were made to the ER with hand and forearm fractures (95% Confidence Interval [CI] 1,656,216-1,667,252). (Table 1) Overall, there were 54 ER visits with hand and forearm fractures per 10,000 in population. Males sustained 58.7% of all fractures. Children aged 6-15 had the highest incidence of ER visits with hand and forearm fractures per 10,000 in population. A secondary increase in visits with fractures per 10,000 in population occurred around age 50, and steadily rose with age. (Figure 1) Radius and ulna fractures were the most common anatomic site of fracture in all age groups except metacarpal and phalanx fractures in young adults aged 16-25. The most common mechanism of injury was fall (45.5%, 95% CI 43.54-47.46), followed by struck by/against (19.4%, 95 % CI 18.06-20.74), and motor vehicle related injury (5.7%, 95% CI 5.62-5.78). However, younger patients had fewer falls and more struck by/against, while the elderly suffered almost exclusively falls. Seasonal variance was also observed, with fractures peaking in May and September.