World Class Orthopaedics Through Specialty Expertise, Research and Continuing Education.
As one of the State’s largest orthopedic groups, Florida Orthopaedic Institute’s (FOI) mission is simple: to provide excellence in clinical outcomes and an exceptional patient experience, while in an environment that fosters growth through teaching, education and research, in all aspects of musculoskeletal medicine.

What has set us apart, is that all of our surgeons are fellowship trained in their area of expertise, which allows for the highest standard of care. This requires an additional year of training in subspecialties including hand, spine, joint replacement, shoulder and elbow, sports medicine, foot and ankle, trauma, and pain management. This proficiency is invaluable for proper diagnosis and treatment, and provides a level of care unrivaled anywhere in the broader Tampa Bay Area.

Together with the University of South Florida’s (USF) Department of Orthopaedic Surgery, many of FOI surgeons practice at Tampa General Hospital (TGH), the region’s premier hospital with over 1,000 in-patient beds, and the academic teaching facility for USF’s Morsani School of Medicine. With over 150 ICU beds, TGH is the only Level I Trauma Center on the west coast of Florida, and is designated as the region’s Brain and Spinal Cord Injury Center, Hand Replant Center, and Regional Burn Facility.

Finally, as the exclusive clinical faculty for the USF Department of Orthopaedic Surgery, FOI/USF at TGH features a full complement of orthopaedic surgeons in every subspecialty, mid-level providers, orthopaedic Fellows in six (6) different subspecialties, and the USF Orthopaedic Surgery Residency Training Program. A total of 54 orthopaedic beds are dedicated to the Orthopaedic Trauma Service, the Hand and Replant Service, the Joint Replacement Center, and one the largest Shoulder and Elbow Programs in the United States. As a result, TGH offers our region the most sophisticated and innovative care available, including robotic surgery, for all aspects of musculoskeletal problems.

This combination of surgical talent, clinical researchers, and a strong residency training program, allows FOI to capitalize on our strengths and advance academic orthopedics. In this publication, we highlight each of our Division’s commitment to research and education. We believe that these attributes bring a substantial benefit to our community, patients, residents, students and faculty.

Sincerely,

Roy Sanders, M.D.
Chief, TGH Department of Orthopaedics
President & CMO, Florida Orthopaedic Institute
Chairman, USF Department of Orthopaedic Surgery

Our physician researchers have published 44 papers in 2017-2018 alone.
Currently leading or participating in 33 prospective clinical trials.
Department of Clinical Research features an in-house biostatistician, as well as 7 full time research coordinators with orthopedic specialization.
Dr. Mark A. Frankle to preside over the American Shoulder and Elbow Society.

The Florida Orthopaedic Institute Chief of Shoulder and Elbow Surgery was elected by the ASES Nominating Committee and the ASES Board for a Presidential term that will run from October 2020 to October 2021. He is currently the Vice President and will serve in this title from October 2018 to October 2019. In 2019, he will be President-Elect, serving from October 2019 to October 2020.

Dr. Frankle has served as the Chief of Shoulder and Elbow Surgery at Florida Orthopaedic Institute since 1992. He attended Rush University College of Medicine after completing three years of undergraduate studies at Grinnell College in Iowa. He then completed his residency training at the University of South Florida (USF) and then achieved an orthopedic pathology and orthopedic implants fellowship at Rush-Presbyterian St. Luke’s Hospital. Dr. Frankle then accomplished a reconstructive technique research fellowship program at the prestigious AO/ASIF Prosthetic/Implant Research and Development Complex in Davos, Switzerland. Dr. Frankle then finished an adult reconstructive surgical fellowship at the Mayo Clinic in Rochester, Minnesota.

For Dr. Frankle, the key to getting patients the best treatment is continuous research. This mindset is the greatest asset for the advancement of the ASES mission of supporting quality shoulder and elbow care through the ethical practice of leadership, medical education, research and quality, and patient advocacy.

Dr. Frankle also serves as the Director of the Biomechanical Shoulder and Elbow Research Lab at the USF College of Engineering and is the Director of the annual course, “Current Concepts in Shoulder and Elbow Surgery.” He has published numerous articles in professional journals and maintains ongoing research projects, presenting his work annually at various professional conferences. Frankle has designed implants and instrumentation used in shoulder replacement for several different orthopedic companies. He has received prestigious awards such as the Charles S. Neer Award for Basic Science from the American Academy of Orthopaedic Surgeons.

Dr. Frankle is board-certified by the American Board of Orthopaedic Surgery.
Dr. Hassan Mir awarded the American-British-Canadian Traveling Fellowship by the American Orthopaedic Association (AOA).

Hassan Mir, M.D., Director of Orthopaedic Trauma Research at Florida Orthopaedic Institute, was awarded the American-British-Canadian Traveling Fellowship by the American Orthopaedic Association (AOA).

Also known as the ABC Fellowship, the Fellowship recognizes young leaders for their early contributions to orthopedics, identifying and promoting their leadership skills to the broader orthopedic community. Since 1948, Fellows have traveled for four to five weeks touring orthopedic centers in United Kingdom, South Africa, Australia, New Zealand, and North America, depending on the year.

Tours are designed to connect young surgeons with other orthopedic leaders. It also helps prepare Fellows for the greater challenges of leading and improving orthopedics, especially when confronting critical issues that impact the field.

Dr. Mir, who is also the Director of the Orthopaedic Residency Program at the University of South Florida, received his undergraduate degree at West Virginia University, where he graduated Summa Cum Laude and was inducted into Phi Beta Kappa. He obtained his Doctor of Medicine from West Virginia University in 2003 and was inducted into Alpha Omega Alpha. Dr. Mir completed his Physician Executive MBA at Auburn University.

Dr. Mir is involved with clinical and health policy research, medical education, and multiple national orthopedic organizations. He has served as the Digital Editor for Orthopaedic Trauma Association International, on the American Academy of Orthopaedic Surgeons (AAOS) Diversity Advisory Board and Council on Advocacy, on the American Osteopathic Association (AOA) Leadership Committee, on the American College of Surgeons (ACS) Committee on Trauma, and as a consultant reviewer for multiple journals. He has authored several articles and chapters and has presented his research at numerous national and international meetings. Additionally, he has participated as faculty at dozens of courses and training programs across the country.

Dr. Kenneth Gustke named a Member of The Knee Society.

Dr. Kenneth Gustke was invited to become a Member of The Knee Society, a closed group of 109 members representing the very best knee replacement surgeons in the world.

The Knee Society promotes outstanding care to patients with knee disorders through innovative research and education in the area of total knee arthroplasty as well as in the pathogenesis of osteoarthritis and other disease processes that lead to end-stage arthritis of the knee.

The Knee Society advances the knowledge of the knee joint in health and disease, provides an appropriate educational setting that will maintain the highest level of professional standards in order to promote continuous advancement in professional knowledge and improved treatment of disorders of the knee, creates an optimum environment to enhance education, research and treatment of arthritis of the knee joint, and promotes and maintains professional standards to provide the best care to patients with arthritic disorders of the knee joint.

Dr. Gustke has practiced medicine in Tampa for over 38 years, is a founding member of the American Association of Hip and Knee Surgeons and is a founding member and past president of Florida Orthopaedic Institute. Dr. Gustke is board certified by the American Board of Orthopaedic Surgery and specializes in adult reconstruction, arthritis surgery, and joint replacement surgery of the hip and knee.

Dr. Gustke is renowned on the national and international level for his pioneering efforts in joint replacement surgery implant design and surgical technique. He has authored over 60 articles, textbook chapters and technical monographs, edited two professional journals and delivered more than 500 lectures locally, nationally and internationally.

As co-designer of eight total hip replacement implants and three complete total knee replacement systems, surgeons have used Dr. Gustke’s implants in thousands of patients worldwide. Dr. Gustke holds three patents on hip replacement design and has been a primary developer of muscle sparing, minimally invasive knee and hip replacement surgical techniques since the 1990s.
Florida Orthopaedic Institute physicians are known nationally and throughout the world for their work in orthopaedic surgery and have been named among the best orthopaedic physicians in America. This is accomplished through subspecialization, continuing scientific and clinical research to enhance the art and science of orthopaedic surgery, and by providing orthopaedic education through courses and lectures, journal publications, Fellowship and residency training.

As one of Florida’s largest orthopaedic groups, Florida Orthopaedic Institute’s mission is to provide patients with world-class orthopaedic care, achieving exceptional outcomes through continuing research and specialty expertise. All surgeons are fellowship trained, providing a level of care unattainable elsewhere in Tampa Bay.

With expertise in virtually every orthopaedic subspecialty, Florida Orthopaedic Institute is one-stop shop, with the ability to manage all aspects of musculoskeletal care.

Founded in 1989, Florida Orthopaedic Institute has grown from 12 orthopaedists working in one office and one hospital, to over 40 physicians, 25 mid-level providers, 15 Fellows, and a professional staff of more than 600, working in 10 offices and 19 regional hospitals, plus two Surgery Centers.

Florida Orthopaedic Institute’s Divisions include Foot and Ankle, Hand and Wrist, Joint Arthroplasty, Oncology, Orthopaedic Trauma, Pain Management, Rehabilitative Medicine, Shoulder and Elbow, Spine Surgery, and Sports Medicine.

Using data, research, and analytics, Florida Orthopaedic Institute continues to provide innovative care to patients, allowing them the best chance to return to a normal lifestyle.

Florida Orthopaedic Institute surgeons at Tampa General Hospital care for a complete range of orthopaedic conditions, including arthritis, fractures, and all musculoskeletal injuries. Surgeons perform joint replacement surgeries, trauma care, and a multitude of other treatments, working collaboratively to improve each patient’s mobility, function, and quality of life. Patients have access to a multidisciplinary team of specialists – including physicians, surgeons, advanced practice nurses, registered nurses, physical and occupational therapists, and social workers – all in a single location, providing a simplified and convenient experience.
Tampa General Hospital earned high performing 2017-2018 recognition from U.S. News & World Report for its knee and hip replacement programs, both of which have low 7- and 30-day readmission rates, low post-operative complication rates, and low rates of patients requesting corrective surgery after their initial procedures.

Not only does Tampa General Hospital’s orthopaedic program excel at providing routine surgical procedures such as hip and knee surgery, but they also excel at providing emergency orthopaedic care for trauma patients. The orthopaedic trauma program provides fracture management, limb-sparing surgeries, bone and joint infection management, and corrective surgeries for nonunions, malunions, and a variety of other orthopaedic conditions. TGH is a regional referral center for complex orthopaedic surgery, and the orthopedic trauma program maintains Gold Seal Certification from The Joint Commission.

Additionally, in combination with USF and Tampa General Hospital, Florida Orthopaedic Institute surgeons use the combined strengths of each partner to advance academic orthopaedics through the USF Orthopaedic Surgery Residency Program. This combination assures patients the finest orthopaedic treatment and brings substantial benefits to the community, patients, residents, and medical students alike.
ORTHOPAEDIC RESIDENCY PROGRAM

The Orthopaedic Surgery Residency Training Program at the USF Health Morsani College of Medicine provides outstanding post-graduate education in the setting of broad spectrum, state-of-the-art clinical services. The goal of the program is to prepare orthopaedic leaders of the future as clinicians, surgeons, and creative investigators. This approach puts trainees on the cutting edge of orthopaedic advancement, and benefits patients and the profession, now and for years to come.

The USF Orthopaedic Residency Program offers exceptional training opportunities at a variety of superb institutions, including world-renowned Moffitt Cancer Center, Florida Hospital Tampa, Shriners Hospitals for Children, and the James A. Haley Veterans Administration Medical Center. These facilities are co-located within walking distance of the main campus of the University of South Florida.

Other participating institutions include John Hopkins All Children’s Hospital, Florida Hospital Carrollwood and Wesley Chapel, and Tampa General Hospital where residents spend the majority of their time and where the academic offices are located.

Residents are provided educational opportunities through lectures, small group discussions and exercises, hands-on sawbones labs, cadaveric training, surgical skills labs, and mobile learning labs for hands-on experience and to explore the latest orthopaedic technologies. They also receive hands-on training at FORE (Foundation for Orthopaedic Research and Education).
Fellowship Program

Surgical Fellowships are designed to offer graduating orthopaedic surgeons advanced training in an orthopaedic subspecialty. The goal of each of these one-year Fellowships is to provide a comprehensive educational, clinical, operative and research opportunity that can only be experienced in a highly specialized, high-volume referral center. Our goal is that the graduating Fellow will become proficient in that field of orthopaedics and develop into an authority in that field for their community.

There are six (6) Fellowships offered through FOI/TGH/USF. Overall, twenty-nine attending staff are involved in the training of a total of 15 Fellows at TGH, making this one of the largest Fellowship programs in the United States.

The Shoulder and Elbow Fellowship under Drs. Mark Frankle and Mark Mighell, consists of three Fellows mastering arthroscopic surgery of the shoulder, as well as fracture care and joint arthroplasty, with one of the largest volume reverse shoulder replacement programs in the country.

The Hand and Wrist Fellowship under the supervision of Dr. Alfred Hess, trains three Fellows in all aspects of upper extremity pathology including congenital hand deformities (at Shriners Hospital for Children) and replantation and limb salvage surgery of the upper extremity using four dedicated hand surgeons at TGH, our Level I facility.

The Foot and Ankle Fellowship, under Dr. Arthur Walling trains two Fellows each year and has long been a center for total ankle replacement training.

The Joint Arthroplasty program with more than 1,300 joint replacements at TGH alone, under the co-direction of Drs. Kenneth Gustke and Thomas Bernasek, and seven other arthroplasty surgeons, trains four Fellows in primary and revision hip and knee replacements, as well as robotic surgery.
The Orthopaedic Trauma Service, under the direction of Dr. Roy Sanders, has trained more than 100 Fellows over the last 30 years. Three Fellows annually are taught by a total of six trauma surgeons in Level I management of the multiply-injured patient.

The ACGME approved Sports Medicine Fellowship, offers a broad-based experience, teaching the care and prevention of injuries to athletes to two Fellows annually. Using an additional four faculty, Fellows are involved in the surgical and office-based management of sports-related injuries as well as supporting team sports including the University of South Florida, University of Tampa, St. Leo University, and most of the high schools in our region.
Orthopaedic Trauma Service

The Orthopedic Trauma Service is a nationally prominent program based at Tampa General Hospital and managed by Florida Orthopaedic Institute, is the only Level I facility in the region. In existence since 1987, the Service has offered leadership in orthopaedic trauma care for 30 years, receiving regional, national and international awards and recognition, both in teaching and training. The program consists of six fellowship trained orthopaedic traumatologists, three trauma Fellows, plus residents providing care for both acute injuries and chronic problems.

Orthopedic trauma surgeons are involved in multi-disciplinary care coordination with general surgery trauma teams, neurosurgeons, plastic and vascular surgeons. Exclusively covering emergency calls at Tampa General, a host of injuries are seen, including open and closed fractures of the upper and lower extremities, pelvic and acetabular fractures, and polytraumatized patients.

Due to our location in Florida, the Orthopedic Trauma Service sees a disproportionate number of watercraft accidents. In addition, acute and chronic infections of the extremities, including necrotizing fasciitis, are managed in an effort to minimize amputations.

The Orthopaedic Trauma Service also specializes in the care of fracture-related problems, such as nonunions, malunions, post-traumatic arthritis, deformity correction, and complex reconstruction of the lower extremity.

The Service has pioneered new techniques such as suprapatellar nail insertion for fractures of the tibia, the use of electromagnetic field sensors for the insertion of locking screws rather than fluoroscopy, calcaneal fracture surgery, and posterior approach to aid in the treatment of ankle fractures.

The Orthopaedic Trauma Service has a dedicated research staff including research nurses and a research coordinator. The Orthopedic Trauma database allows the Service to evaluate patients and report on their outcomes which has resulted in well over 150 publications, all based on the clinical work at Tampa General Hospital. Additionally, the Service was one of only 10 sites nationally involved in the NIH supported LEAP Project to evaluate lower extremity trauma.

The Orthopedic Trauma Service continues to be involved in the METRC studies, sponsored by the Department of Defense evaluating trauma care and specific injury issues in the lower extremity.

Because of the increase in retirees in Florida, the Service sees a high volume of geriatric fractures, and has created the Geriatric Fracture Service, a multi-disciplinary program, to expedite care of these individuals. Results show that early aggressive treatment of their injuries, lowers morbidity as well as mortality.
The Orthopaedic Trauma Service performed 3,720 cases in 2017.

FLORIDA ORTHOPAEDIC INSTITUTE TRAUMA SURGEONS
Pictured Front row (l to r) Dr. Roy Sanders, Dr. Hassan Mir;
Back row (l to r) Dr. David Watson, Dr. Anthony Infante, Jr., Dr. Anjan Shah, Dr. Benjamin Maxson

CHRISTENSEN J1, SPENCE S2, WATSON D3, SHAH A3, MAXSON B3, INFANTE A3, SANDERS R3, MIR HR3.

OBJECTIVE: To review the orthopaedic injuries from watercraft treated surgically at our institution and report the mechanisms, fractures, and complications encountered.

DESIGN: Retrospective case series.

SETTING: Level I trauma center.

PATIENTS/PARTICIPANTS: There were 216 fractures from watercraft in 146 patients. Average age was 33 years (range 4-78 years), there were 68% males (99/146), and 16% of the injuries occurred in children.

INTERVENTION: Operative fracture fixation.

MAIN OUTCOME MEASUREMENTS: After IRB approval, data were collected from January 1, 1998, to December 31, 2015, for patients including demographics, watercraft type, mechanism of injury, fracture pattern, infection, organisms, union, and amputation. Descriptive statistics were used.

RESULTS: There were 130 closed fractures (60%) and 86 open fractures (40%). There were 146 (67%) lower extremity injuries, 49 (23%) upper extremity injuries, and 21 (10%) pelvic injuries. The overall postoperative infection rate was 9% (20/216) and was commonly polymicrobial in nature. The postoperative infection rate in closed fractures was 4% (5/130) and the postoperative infection rate in open fractures was 17% (15/86). Open fractures also had a high proportion of nonunion (8%) and amputation (16%).

CONCLUSIONS: This is the largest reported series of orthopaedic injuries from watercraft. These injuries can be devastating in nature and difficult to manage, particularly when they are open (40%). There is a high rate of postoperative infection (17%), nonunion (8%), and amputation (16%) associated with open orthopaedic watercraft fractures.

LEVEL OF EVIDENCE: Prognostic Level IV. See Instructions for Authors for a complete description of levels of evidence.

Cephalomedullary Nail Fixation of Intertrochanteric Femur Fractures: Are Two Proximal Screws Better Than One?

SERRANO R1, BLAIR JA, WATSON DT, INFANTE AF JR, SHAH AR, MIR HR, MAXSON BJ, DOWNES KL, SANDERS RW.

OBJECTIVES: To analyze radiographic changes in intertrochanteric (IT) fracture alignment after treatment with either a single sliding lag screw or an integrated compressed and locked, dual screw, cephalomedullary nail construct.

DESIGN: Retrospective comparative study.

SETTING: Level I regional trauma center.

PATIENTS: 1004 OTA/AO 31A, 31B2.1 fractures treated with either a single screw cephalomedullary nail (Gamma 3) or an integrated dual screw cephalomedullary nail (InterTAN) between February 1, 2005, and June 30, 2013. Four hundred thirteen remained after exclusion criteria; 130 were treated with a single screw device (79 stable and 51 unstable), and 283 with an integrated dual screw device (155 stable and 128 unstable).

INTERVENTION: Cephalomedullary nail insertion.

OUTCOME MEASURES: Radiographic analysis included fracture pattern, fracture reduction, neck-shaft angle (NSA), and femoral neck shortening (FNS) differences at 3, 6, and 12 months. Measurements were normalized using known lag screw dimensions, digitally corrected for magnification. Rotation between x-rays was controlled using a ratio of known to measured dimensions. The Mann-Whitney U test was used for statistical analysis.

RESULTS: The single screw device resulted in 2.5 times more varus collapse (NSA) and 2 times more FNS over 1 year, as compared to the locked, integrated dual screw device, regardless of stability (P < 0.001). NSA and FNS changes were greater for both devices in unstable fracture patterns, but significantly less movement occurred with the dual screw device (P < 0.001).

CONCLUSIONS: A cephalomedullary nail with 2 integrated proximal screws that can be compressed and then locked seems to maintain initial IT fracture reduction and subsequent position over time, with less varus collapse and less shortening than a single screw device.
OTA/AO Classification Is Highly Predictive of Acute Compartment Syndrome After Tibia Fracture: A Cohort of 2885 Fractures.

BEEBE MJ1, AUSTON DA, QUADE JH, SERRANO-RIERA R, SHAH AR, WATSON DT, SANDERS RW, MIR HR.

OBJECTIVE: To determine the correlation between the OTA/AO classification of tibia fractures and the development of acute compartment syndrome (ACS).

DESIGN: Retrospective review of prospectively collected database.

SETTING: Single Level 1 academic trauma center.

PATIENTS: All patients with a tibia fracture from 2006 to 2016 were reviewed for this study. Three thousand six hundred six fractures were initially identified. Skeletally mature patients with plate or intramedullary fixation managed from initial injury through definitive fixation at our institution were included, leaving 2885 fractures in 2778 patients.

METHODS: After database and chart review, univariate analyses were conducted using independent t tests for continuous data and χ tests of independence for categorical data. A simultaneous multivariate binary logistic regression was developed to identify variables significantly associated with ACS.

RESULTS: ACS occurred in 136 limbs (4.7%). The average age was 36.2 years versus 43.3 years in those without (P < 0.001). Men were 1.7 times more likely to progress to ACS than women (P = 0.012). Patients who underwent external fixation were 1.9 times more likely to develop ACS (P = 0.003). OTA/AO 43 injuries were at least 4.0 times less likely to foster ACS versus OTA/AO 41 or 42 injuries (P < 0.007). OTA/AO41-C injuries were 5.5 times more likely to advance to ACS compared with OTA/AO 41-A (P = 0.03). There was a significantly higher rate of ACS in OTA/AO 42-B (P = 0.005) and OTA/AO 42-C (P = 0.002) fractures when compared with OTA/AO 42-A fractures. In the distal segment, fracture type did not predict the risk of ACS (P > 0.15). Group 1 fractures had a lower rate of ACS compared with group 2 (P = 0.03) and group 3 (P = 0.003) fractures in the middle segment only. Bilateral tibia fractures had a 2.7 times lower rate of ACS (P = 0.04). Open injury, multiple segment injury, fixation type, and concurrent pelvic or femoral fractures did not predict ACS.

CONCLUSIONS: In this large cohort of tibia fractures, we found that the age, sex, and OTA/AO classification were highly predictive for the development of ACS.
ABSTRACT

ANTERIOR-INFERIOR PLATING RESULTS IN FEWER SECONDARY INTERVENTIONS COMPARED TO SUPERIOR PLATING FOR ACUTE DISPLACED MIDSHAFT CLAVICLE FRACTURES.

SERRANO R1, BORADE A, MIR H, SHAH A, WATSON D, INFANTE A, FRANKLE MA, MIGHELL MA, SAGI HC, HORWITZ DS, SANDERS RW.

OBJECTIVES: To determine whether a difference in plate position for fixation of acute, displaced, midshaft clavicle fractures would affect the rate of secondary intervention.

DESIGN: Retrospective Comparative Study.

SETTING: Two academic Level 1 Regional Trauma Centers.

PATIENTS: Five hundred ten patients treated surgically for an acutely displaced midshaft clavicle fracture between 2000 and 2013 were identified and reviewed retrospectively at a minimum of 24 months follow-up (F/U). Fractures were divided into 2 cohorts, according to plate position: Anterior-Inferior (AI) or Superior (S). Exclusion criteria included age <16 years, incomplete data records, and loss to F/U. Group analysis included demographics (age, sex, body mass index), fracture characteristics (mechanism of injury, open or closed), hand dominance, ipsilateral injuries, time between injury to surgery, time to radiographic union, length of F/U, and frequency of secondary procedures.

INTERVENTION: Patients were treated either with AI or S clavicle plating at the treating surgeon’s discretion.

MAIN OUTCOME RESULTS: Rate and reason for secondary intervention.

STATISTICAL ANALYSIS: Fisher exact test, t test. and odds ratio were used for statistical analysis.

RESULTS: Final analysis included 252 fractures/251 patients. One hundred eighteen (47%) were in group AI; 134 (53%) were in group S. No differences in demographics, fracture characteristics, time to surgery, time to union, or length of F/U existed between groups. Seven patients/7 fractures (5.9%) in Group AI underwent a secondary surgery whereas 30 patients/30 fractures (22.3%) in group S required a secondary surgery. An additional intervention secondary to superior plate placement was highly statistically significant (P < 0.001). Furthermore, because 80% of these subsequent interventions were a result of plate irritation with patient discomfort, the odds ratio for a second procedure was 5 times greater in those fractures treated with a superior plate.

CONCLUSIONS: This comparative analysis indicates that AI plating of midshaft clavicle fractures seems to lessen clinical irritation and results in significantly fewer secondary interventions. Considering patient satisfaction and a reduced financial burden to the health care system, we recommend routine AI plate application when open reduction internal fixation of the clavicle is indicated.

ABSTRACT

CONTROLLED COMPRESSION NAILING FOR AT RISK HUMERAL SHAFT FRACTURES.

WATSON JT1, SANDERS RW.

Compression techniques seem to be the primary factor in determining the success of both plating and nailing techniques for the management of acute fractures and for delayed and nonunion management of these fractures. An intramedullary nail that can provide continual compression (like a plate) and mechanical manipulation of the callous throughout the course of treatment is an ideal device that provides all the advantages of plating and nailing and avoids the noted limitations of both. The UNYTE compression humeral nail is based on the PRECICE intramedullary limb lengthening system. This nail provides the ability to intraoperatively compress a humeral fracture immediately and continue compression in the outpatient setting with the external remote controller. This compression nail allows the surgeon to continually modulate stability through controlled compression and the ability to relengthen if necessary. The capacity to achieve constant compression at the fracture site has demonstrated rapid healing of the “at risk” humerus fracture in this series. We review the current indications for use of this device after its early introduction. In most cases, this was the failure of conservative brace management that presented with a progressive distraction gap and minimal callous formation or those fractures that could not be adequately controlled in the brace with malalignment greater than 20 degrees. The protocol for intraoperative compression using the external remote controller is detailed, as is the outpatient protocol for follow-up. The compression algorithm for progression to full fracture healing is also reviewed.
Reverse Total Shoulder Arthroplasty for Complex Three- and Four-Part Proximal Humerus Fractures in Elderly Patients: A Review.
LEBUS V GF1, MIR HR, BUSHNELL BD.

Complex proximal humerus fractures in elderly patients represent a difficult problem for orthopaedic surgeons. Classically, treatment methods have included nonoperative management, open reduction and internal fixation, and hemiarthroplasty. Outcomes of nonoperative management for these complex fractures have been poor, and results of traditional operative techniques are variable at best. Over the past several years, reverse total shoulder arthroplasty (RTSA) has been increasingly employed in these injuries with encouraging results. RTSA may represent a valuable treatment option for select patients. This article reviews the existing data on RTSA in the treatment of complex proximal humerus fractures in the elderly population as well as the authors' experience with this technique.

Percutaneous or Open Reduction of Closed Tibial Shaft Fractures During Intramedullary Nailing Does Not Increase Wound Complications, Infection or Nonunion Rates.

OBJECTIVE: To compare the incidence of complications (wound, infection, and nonunion) among those patients treated with closed, percutaneous, and open intramedullary nailing for closed tibial shaft fractures.

DESIGN: Retrospective review.

SETTING: Multiple trauma centers.

PATIENTS: Skeletally mature patients with closed tibia fractures amenable to treatment with an intramedullary device.

INTERVENTION: Intramedullary fixation with closed, percutaneous, or open reduction.

MAIN OUTCOME MEASUREMENTS: Superficial wound complication, deep infection, nonunion.

RESULTS: A total of 317 tibial shaft fractures in 315 patients were included in the study. Two-hundred fractures in 198 patients were treated with closed reduction, 61 fractures in 61 patients were treated with percutaneous reduction, and 56 fractures in 56 patients were treated with formal open reduction. The superficial wound complication rate was 1% (2/200) for the closed group, 1.6% (1/61) for the percutaneous group, and 3.6% (2/56) for the open group with no statistical difference between the groups (P = 0.179). The deep infection rate was 2% (4/200) for the closed group, 1.6% (1/61) for the percutaneous group, and 7.1% (4/56) for the open group with no significant difference between the groups (P = 0.133). Nonunion rate was 5.0% (10/200) for the closed group, 4.9% (3/61) for the percutaneous group, and 7.1% (4/56) for the open group, with no statistical difference between the groups (P = 0.492).

CONCLUSIONS: This is the largest reported series of closed tibial shaft fractures nailed with percutaneous and open reduction. Percutaneous or open reduction did not result in increased wound complications, infection, or nonunion rates. Carefully performed percutaneous or open approaches can be safely used in obtaining reduction of difficult tibial shaft fractures treated with intramedullary devices.
Does a Staged Posterior Approach Have a Negative Effect on OTA 43C Fracture Outcomes?

CHAN DS1, BALTHROP PM, WHITE B, GLASSMAN D, SANDERS RW.

**OBJECTIVE:** To determine whether multiple approaches pose an increased risk to fracture healing when compared with a standard single approach in the treatment of pilon (OTA 43C) fractures.

**DESIGN:** Retrospective review of a prospective database.

**SETTING:** Level I academic trauma center and level II community trauma center.

**METHODS:** From January 1, 2005 to December 31, 2011, all records of patients treated for OTA 43C fractures of the distal tibia were reviewed. Patients were grouped according to multiple (posterior-anterior) and single (anterior-alone) approaches. Medical charts and surgical documentation were reviewed and postoperative computed tomography (CT) scans were examined for residual articular displacement and quantified. Ultimate union rate was correlated with approach strategy. Articular reduction was subdivided into 3 groups (<1, 1-2, and >2 mm).

**RESULTS:** A total of 116 patients were identified as having had 43C fractures treated surgically with postoperative CT scans completed. Twenty-six fractures presented as an open injury. Of these 116 patients, 35 underwent staged fixation of the posterior malleolar component at an average of 2 days postinjury, followed by delayed anterior fixation at an average of 14 days postinjury. The remaining 81 patients underwent anterior fixation alone, on average 17 days postinjury. Twenty-one patients were lost to follow-up before 12 months. Of the 95 patients with sufficient follow-up (≥12 months), there were 24 nonunions. There was a statistically significant association of nonunion with staged posterior approach (40% vs. 19%, P = 0.015). CT reduction for staged posterior versus anterior-alone approach was not significantly different for any of the 3 categories (63% vs. 57% <1 mm, 31% vs. 26% 1-2 mm, and 6% vs. 17% >2 mm).

**CONCLUSIONS:** In this series, there was no statistically proven benefit to combined surgical approaches to tibial pilon fractures with regard to the quality of articular reduction. It appears from this investigation that there may be a significantly higher risk of nonunion associated with the addition of the staged posterior approach. Although articular reduction is of paramount importance, multiple approaches for direct reduction and fixation of all fragments may lead to further complications.

Sarcopenia Is Predictive of 1-Year Mortality After Acetabular Fractures in Elderly Patients.

MITCHELL PM1, COLLINGE CA, O’NEILL DE, BIBLE JE, MIR HR.

**OBJECTIVES:** To determine whether sarcopenia is an independent predictor of mortality in geriatric acetabular fractures.

**DESIGN:** Retrospective cohort.

**SETTING:** American College of Surgeons Level I trauma center.

**PATIENTS/PARTICIPANTS:** One hundred and forty-six patients over the age 60 with acetabular fractures treated at our institution over a 12-year period.

**MAIN OUTCOME MEASUREMENTS:** The primary outcome was 1-year mortality, collected using the Social Security Death Index. We used the psoas:lumbar vertebral index (PLVI), calculated using the cross-sectional area of the L4 vertebral body and the left and right psoas muscles, to assess for sarcopenia.

**RESULTS:** Using a multivariate logistic regression model, we found that low PLVI was associated with increased 1-year mortality (P = 0.046) when controlling for age, gender, Charlson Comorbidity Index, Injury Severity Score (ISS), smoking status, and associated pelvic ring injury. Increasing age and ISS also showed a relationship with 1-year mortality in this cohort (P < 0.001, P < 0.001, respectively). We defined sarcopenia as those patients in the lowest quartile of PLVI. The mortality rate of this cohort was 32.4%, compared with 11.0% in patients without sarcopenia (odds ratio 4.04; 95% confidence interval 1.62-10.1). Age >75 years, ISS >14, and sarcopenia had 1-year mortality rates of 37.1%, 30.9%, and 32.4%, respectively. In patients with all 3 factors, the mortality rate was 90%.

**CONCLUSION:** Sarcopenia is an independent risk factor for 1-year mortality in elderly patients with acetabular fractures. This study highlights the importance of objective measures to assess frailty in elderly patients who have sustained fractures about the hip and pelvis.
Fixation Strategy Using Sequential Intraoperative Examination Under Anesthesia for Unstable Lateral Compression Pelvic Ring Injuries Reliably Predicts Union with Minimal Displacement.

AVILUCEA FR1, ARCHDEACON MT2, COLLINGE CA3, SCIADINI M4, SAGI HC5, MIR HR6.

BACKGROUND: Examination under anesthesia (EUA) has been used to identify pelvic instability. Surgeons may utilize percutaneous methods for posterior and anterior pelvic ring stabilization. We developed an intraoperative strategy whereby posterior fixation is performed, with reassessment using sequential EUA to determine the need for anterior fixation. Our aim in the current study was to evaluate whether this strategy reliably results in union with minimal displacement.

METHODS: This was a multicenter retrospective study involving adult patients with closed lateral compression (LC) pelvic ring injuries treated during the period of 2013 to 2016. Included were patients who underwent percutaneous pelvic fixation based on sequential EUA. Data points included patient demographics, injury and fixation details, and displacement as observed on follow-up radiographs.

RESULTS: Complete documentation was available for 74 patients (mean age, 41 years). The mean duration of follow was 11 months. Fifty-three of the patients had LC-1 injuries, 19 had LC-2 injuries, and 2 had LC-3 injuries. Twenty-five (47.2%) of the 53 patients with LC-1 and 11 (57.9%) of the 19 patients with LC-2 injuries did not undergo anterior fixation on the basis of the algorithm. The 36 LC-1 or LC-2 patients who underwent combined anterior and posterior fixation had no measurable displacement at union. Of the 36 LC-1 or LC-2 patients with no anterior fixation, 27 with unilateral rami fractures had no measurable displacement at union. The remaining 9 LC-1 or LC-2 cases with no anterior fixation had bilateral superior and inferior rami fractures; each of these patients demonstrated displacement (mean, 7.5 mm; range, 5 to 12 mm) within 6 weeks of fixation that remained until union. All patients had protected weight-bearing for 12 weeks.

CONCLUSIONS: A fixation strategy based on sequential intraoperative EUA reliably results in union with minimal displacement for unstable LC pelvic ring injuries. Injuries requiring combined anterior and posterior fixation healed with no displacement. Those without anterior fixation and a unilateral ramus fracture healed with no displacement. In the presence of bilateral rami fractures, even with a negative finding on sequential EUA, the pelvis healed with 7.5 mm average displacement. Surgeons may consider anterior fixation to prevent this displacement.

Outcomes of Early Surgical Intervention in Geriatric Proximal Femur Fractures Among Patients Receiving Direct Oral Anticoagulation.

FRANKLIN NA1, ALI AH2, HURLEY RK1, MIR HR2, BELTRAN MJ1.

OBJECTIVE: To evaluate the prehospital use of direct oral anticoagulant (DOAC) agents on the outcomes of early surgical fixation of a geriatric hip fracture.

DESIGN: Case control study.

SETTING: Two academic Level 1 trauma centers.

INTERVENTION: Early (<48 h) surgical fixation of a geriatric proximal femur fracture.

PATIENTS: Nineteen patients receiving Pradaxa (dabigatran), Eliquis (apixaban), or Xarelto (rivaroxaban) who underwent surgery between 2010 and 2015 and 74 control patients.

MAIN OUTCOME MEASUREMENTS: Time to surgery, transfusion rates, changes in hemoglobin levels, postoperative complications, readmission rates, and survival out to 1 year.

RESULTS: There were no differences in transfusions, changes in hemoglobin levels, wound complications, or survival at any time point. Patients on DOAC had a longer delay to reach the operating room (28.9 h vs. 21.4 h P = 0.03) and were more likely to undergo readmission within 30 days (21% vs. 5.3% P = 0.05). No readmissions occurred for a complication of the surgical site, bleeding, or a venous thromboembolic event.

CONCLUSIONS: Geriatric patients with hip fractures receiving DOAC before admission did not demonstrate worse outcomes with early surgical intervention. The increased readmission rate in this population seems attributable to the underlying cardiac conditions for which the patients were receiving anticoagulation. These results suggest that the delay recommended for patients using a DOAC before elective procedures may be unwarranted in the surgically urgent setting of a hip fracture. Additional studies will be necessary for appropriate meta-analysis.
Outcomes of Distal Femur Nonunions Treated With a Combined Nail/Plate Construct and Autogenous Bone Grafting.

ATTUM B1, DOULEH D, WHITING PS, WHITE-DZURO GA, DODD AC, SHEN MS, MIR HR, OBREMSKEY WT, SETHI MK.

In this study, we sought to retrospectively evaluate union and infection rates after treatment of distal femur nonunions using a combined nail/plate construct with autogenous bone grafting obtained from the ipsilateral femur using a reamer irrigator aspirator system. Ten (10) patients treated at a Level I trauma center for nonunion of a femoral fracture using a combined nail/plate construct from 2004 to 2014 were included in the study. Union rate and postoperative infection rates were recorded. Mean interval from index surgery to nonunion repair was 12 months (range 4-36 months). Follow-up at 24 months indicated that the entire cohort of 10 patients achieved clinical union and radiographic union based on radiograph union score in tibias (RUST) criteria. Treatment of distal femur nonunions with a combined nail/plate construct and autogenous bone grafting results in a high rate of union with a low complication rate.


WHITING PS1, ANDERSON DR, GALAT DD, ZIRKLE LG, LUNDY DW, MIR HR.

OBJECTIVES: To document the current state of pelvic and acetabular surgery in the developing world and to identify critical areas for improvement in the treatment of these complex injuries.

DESIGN: A 50-question online survey.


PATIENTS/PARTICIPANTS: One hundred eighty-one orthopaedic surgeons at Surgical Implant Generation Network (SIGN) hospitals, which represent a cross-section of institutions in low- and middle-income countries that treat high-energy musculoskeletal trauma.

INTERVENTIONS: Administration and analysis of 50-question survey.

MAIN OUTCOME MEASURES: Surgeon training and experience; hospital resources; volume and patterns of pelvic/acetabular fracture management; postoperative protocols and resources for rehabilitation; financial responsibilities for patients with pelvic/acetabular fractures.

RESULTS: Complete surveys were returned by 75 institutions, representing 61.8% of the global SIGN nail volume. Although 96% of respondents were trained in orthopaedic surgery, 53.3% have no formal training in pelvic or acetabular surgery. Emergency access to the operating room is available at all responding sites, but computed tomography scanners are available at only 60% of sites, and a mere 21% of sites have access to angiography for pelvic embolization. Cannulated screws (53.3%) and pelvic reconstruction plates (56%) are available at just over half of the sites, and 68% of sites do not have pelvic reduction clamps and retractors. 21.3% of sites do not have access to intraoperative fluoroscopy. Responding hospitals see an average of 38.8 pelvic ring injuries annually, with 24% of sites treating them all nonoperatively. Sites treated an average of 22.5 acetabular fractures annually, with 34.7% of institutions treating them all nonoperatively. Patients travel up to 1000 km or 20 hours for pelvic/acetabular treatment at some sites. Although 78.7% of sites have inpatient physical or occupational therapy services, only 17% report access to home physical therapy, and only 9% report availability of nursing or rehabilitation facilities post discharge. At over 80% of hospitals, patients and their families are at least partially responsible for payment of surgical, implant, hospital, and outpatient fees. Government aid is available for inpatient fees at over 40% of sites, but outpatient services are subsidized at only 28% of sites.

CONCLUSIONS: We report the current state of pelvic and acetabular surgery in low- and middle-income countries. Our results identify significant needs in surgeon training, hospital resources, availability of instruments and implants, and access to appropriate postoperative rehabilitation services for pelvic and acetabular surgery in the developing world. Targeted programs designed to overcome these barriers are required to advance the care of pelvic and acetabular fractures in the developing world.
Damage Control Plating in Open Tibial Shaft Fractures: A Cheaper and Equally Effective Alternative to Spanning External Fixation.

WHITING PS1, MITCHELL PM, PERDUE AM, SILVERBERG AJ, GREENBERG SE, THAKORE RV, SATHIYAKUMAR V, MIR HR, OBREMSKEY WT, SETHI MK.

The purpose of this study was to evaluate damage control plating (DCP) as an alternative to external fixation (EF) in the provisional stabilization of open tibial shaft fractures. Through retrospective analysis, the study found 445 patients who underwent operative fixation for tibial shaft fractures from 2008 to 2012. Twenty patients received DCP or EF before intramedullary nailing with a minimum follow-up of 3 months. Charts and radiographs were reviewed for postoperative complications. Hospital charges were reviewed for implant costs. Nine patients (45%) with DCP and 11 patients (55%) with EF were analyzed. There was no significant difference in the complication rates. The mean implant cost of DCP was $1028, whereas mean EF construct cost was $4204. Therefore, DCP resulted in significant cost savings with no difference in complication rates, making it a valuable alternative to EF for the provisional stabilization of open tibial shaft fractures.

How High Can You Go?: Retrograde Nailing of Proximal Femur Fractures.

KUHN KM1, CANNADA LK, WATSON JT, ALI A, BOUDREAU JA, MIR HR, BAUER JM, MULLIS B, HYMES R, GENOVA R, TUCKER M, SCHLATTER D.

There are no data-supported recommendations on how proximal is too proximal for retrograde nailing (RGN). At six level 1 trauma centers, patients with femur fractures within the proximal one-third of the femur treated with RGN were included. This article describes a proximal segment capture ratio (PSCR) and nail segment capture ratio to evaluate RGN of proximal fractures. The study included 107 patients. The average follow-up was 44 weeks. There were two nonunions and three malunions. There was no significant difference between PSCR of 0.3 or less and need for secondary procedures or time to full weight bearing (p>.05). In this study, a smaller (< 0.3) PSCR was not associated with an increased number of complications. A higher Orthopaedic Trauma Association classification was predictive of malunion and increased time to union. These data demonstrate that retrograde nailing is safe and effective for the treatment of supraisthmal femur fractures.

Potential Economic Benefits of Limited Clinical and Radiographic Follow-up After Plate Fixationof Midshaft Clavicle Fractures.

SANCHEZ MORALES D1, BORADE A, SERRANO-RIERA R, MANIAR HH, SANDERS RW, HORWITZ DS.

INTRODUCTION: The role of routine clinical and radiographic follow-up after clavicle fractures are healed was evaluated.

METHODS: A retrospective study performed in two level-1 trauma centers included 246 adults with healed clavicle fractures treated surgically between 2000 and 2013 and at least 24-month follow-up. Based on radiographs, changes in fracture alignment or implant position from union to final follow-up were documented. The average reimbursement for a follow-up clinical visit and a clavicle radiograph was estimated.

RESULTS: Mean time to union and mean time of follow-up were of 4.8 and 31.4 months, respectively. No changes in implant position or fracture alignment occurred after the fracture had healed. The amount reimbursed to our institution for two clinical visits and two clavicle radiographs was approximately $300 to $540.

CONCLUSION: Once clavicle fractures are healed, further radiographic imaging does not provide any notable information. Limiting routine follow-up is safe and could be cost-effective for the healthcare system.
**ABSTRACT**

**Negative Stress Examination Under Anesthesia Reliably Predicts Pelvic Ring Union Without Displacement.**

**WHITING PS1, AUSTON D, AVILUCEA FR, ROSS D, ARCHDEACON M, SCIADINI M, COLLINGE CA, SAGI HC, MIR HR.**

**OBJECTIVES:** To identify the negative predictive value of examination under anesthesia (EUA) for determining pelvic ring stability and union without further displacement.

**DESIGN:** Retrospective cohort study.

**SETTING:** Two academic Level 1 trauma centers.

**PATIENTS/PARTICIPANTS:** Thirty-four adult patients with closed pelvic ring injuries treated over a 5-year period.

**INTERVENTIONS:** Pelvic stress EUA.

**MAIN OUTCOME MEASURES:** Pelvic ring union and pelvic ring displacement at final follow-up.

**RESULTS:** Thirty-four patients with closed pelvic ring injuries who underwent pelvic EUA during the study period and had a negative examination (indicating a stable pelvis) were identified. Mean age was 38 years (range 16-76), and 19 patients (55.9%) were male. Twenty-two patients (64.7%) had Young-Burgess lateral compression (LC)-1 injuries with complete sacral fractures, 4 patients (11.8%) had LC-2 injuries, and 8 patients (23.5%) had anteroposterior compression (APC)-1 injuries. Eight patients (23.5%) had associated injuries requiring restricted weight-bearing on one or both lower extremities and were excluded from the analysis. Immediate weight-bearing as tolerated was permitted bilaterally in the remaining 26 patients. Mean pelvic ring displacement at the time of injury was 3.8 mm (range 1-15 mm) for LC injuries and 9.1 mm (range 2-20 mm) for APC injuries. Patients were followed for a mean of 8 months (range 3-34 months). At final follow-up, mean displacement was 3.7 mm (range 0-17 mm) for LC injuries and 7.1 mm (range 2-19 mm) for APC injuries. Mean change in displacement from injury to union was -0.1 mm for LC injuries and -2.0 mm for APC injuries, indicating decreased pelvic ring displacement at union. All patients were able to tolerate full weight-bearing bilaterally with no pain, and there were no instances of delayed operative fixation after negative EUA.

**CONCLUSIONS:** Negative pelvic EUA after closed pelvic ring injury accurately predicts pelvic stability and union without displacement after nonoperative treatment with full weight-bearing bilaterally. Unless otherwise dictated by associated injuries, immediate weight-bearing as tolerated seems safe in patients with pelvic ring injuries who have had a negative EUA.

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**ABSTRACT**

**In Vivo Correlation of Radiographic Scoring (Radiographic Union Scale for Tibia Fractures) and Biomechanical Data in a Sheep Osteotomy Model: Can We Define Union Radiographically?**

**LITRENTA J1, TORNETTA P 3RD, RICCI W, SANDERS RW, O’TOOLE RV, NASCONE JW, FABER H, WILSON D.**

**OBJECTIVE:** To determine (1) the reliability of the standard and modified Radiographic Union Scale for Tibia fractures (RUST) score in a sheep osteotomy model, and (2) the standard and modified RUST scores that represent biomechanical union.

**DESIGN:** The tibia cortices in a sheep osteotomy model treated by intramedullary nails were radiographically evaluated using standard and modified RUST scores. Scores that correlated with biomechanical union, based on the torsional stiffness of the contralateral tibia, were determined.

**INTERVENTION:** Two groups of sheep had transverse midshaft osteotomies treated with 10-mm nails after reaming to 11.5 mm. Weight-bearing was allowed as tolerated. Anteroposterior and lateral radiographs were taken at standard intervals from 4 to 12 weeks. The tibial cortices at each time interval were evaluated in a random order by 5 senior orthopaedic trauma surgeons. Each tibia was scored using the standard and modified RUST methods and was assessed for union.

**MAIN OUTCOME MEASURES:** The intraclass correlation coefficient (ICC) was determined for standard and modified RUST scores at each time interval and for the assessment of union. The percentages of fractures that were defined as united by the surgeons were tabulated by RUST and modified RUST scores. The torsional stiffness of each tibia was tested at 12 weeks and expressed as a percentage of the contralateral side. We considered biomechanical union to be ≥90% of the torsional stiffness of the normal side.

**RESULTS:** The modified RUST score demonstrated consistently higher ICCs than the standard RUST. All reviewers considered a standard RUST of 10 and a modified RUST of 14 to represent radiographic union. The standard RUST was 10.4 (range: 8.6-12) and modified RUST was 14.2 (range: 12.2-16) for tibiae that were biomechanically united.

**CONCLUSIONS:** The modified RUST score has a slightly higher ICC than the standard RUST. A standard RUST of 10 and a modified RUST of 14 provide an excellent definition of union based on surgeons’ opinion and biomechanical testing for a transverse fracture.
Orthopaedic Trauma Service

Transtibial Amputation Outcomes Study (TAOS): Comparing Transtibial Amputation With and Without a Tibiofibular Synostosis (Ertl) Procedure.

Bosse MJ1, Morshed S, Reider L, Ertl W, Toledano J, Firoozabadi R, Seymour RB, Carroll E, Scharfstein DO, Steverson B, Mackenzie EJ; METRC Collaborators (85)

The optimal technique for a transtibial amputation in a young, active, and healthy patient is controversial. Proponents of the Ertl procedure (in which the cut ends of the tibia and fibula are joined with a bone bridge synostosis) argue that the residual limb is more stable which confers better prosthetic fit and improved function especially among high-performing individuals. At the same time, the Ertl procedure is associated with longer operative and healing time and may be associated with a higher complication rate compared with the standard Burgess procedure. The TAOS is a prospective, multicenter randomized trial comparing 18-month outcomes after transtibial amputation using the Ertl versus Burgess approach among adults aged 18 to 60. The primary outcomes include surgical treatment for a complication and patient-reported function. Secondary outcomes include physical impairment, pain, and treatment cost.

A Prospective Randomized Trial to Assess Fixation Strategies for Severe Open Tibia Fractures: Modern Ring External Fixators vs. Internal Fixation (FIXIT Study). (METRC Multi-Center, FOI Pt: Shah)

Outcomes Following Severe Distal Tibia, Ankle and/or Foot Trauma: Comparison of Limb Salvage vs. Transtibial Amputation Protocol (OUTLET Study). (METRC Multi-center, FOI Pt: Sanders)

Local Antibiotic Therapy to Reduce Infection After Operative Treatment of Fractures at High Risk of Infection: A Multicenter Randomized, Controlled Trial (VANCO). (METRC Multi-center, FOI Pt: Mir)

Major Extremity Trauma Research Consortium (METRC): Streamlining Trauma Research Evaluation with Advanced Measurement: STREAM (METRC Multi-center, FOI Pt: Mir)

Major Extremity Trauma Research Consortium (METRC): Improving recovery after Orthopaedic Trauma: Cognitive Behavioral Based Physical Therapy (METRC Multi-center, FOI Pt: Mir)

A Prospective Randomized Trial of Intertrochanteric Femoral Fractures Treated with a Single Screw Versus a Two-Integrated Screw Cephalo-medullary nail. (Pt: Mir)

Health Literacy in Post Acute Care (Pt: Mir)

Suprapatellar 5 year Outcomes (Pt: Mir)
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Massive Rotator Cuff Tears in Patients Over Sixty-five: Indications for Cuff Repair versus Reverse Total Shoulder Arthroplasty.

ALLERT J, SELLERS T, SIMON P, CHRISTMAS K, Patel SS, FRANKLE M.

Accepted in American Journal of Orthopedics.

PURPOSE: The decision to perform rotator cuff repair (RCR) versus reverse total shoulder arthroplasty (rTSA) for massive rotator cuff tear (MCT) without arthritis can be difficult. Our aim was to identify preoperative variables that are influential in a surgeon’s decision to choose one of the two procedures and evaluate outcomes.

METHODS: We retrospectively reviewed 181 patients older than 65 who underwent RCR or rTSA for MCT without arthritis. Clinical and radiographic data were collected and used to evaluate the preoperative variables in each of these two patient populations and assess outcomes.

RESULTS: Ninety-five shoulders underwent RCR and 92 underwent rTSA with an average followup of 44 and 47 months, respectively. Patients selected for RCR had greater preoperative flexion (113 vs 57), abduction (97 vs 53), and external rotation (42 vs 32), higher SST (3.1 vs 1.9) and ASES scores (43.8 vs 38.6), and were less likely to have had previous cuff surgery (6.3% vs 35.9%). Patients selected for rTSA had a smaller acromiohumeral interval (4.8 vs 8.7) and more superior subluxation (50.6% vs 14.1%). Similar preoperative characteristics included pain, comorbidities, and BMI. Patients were satisfied in both groups and had significant improvement in motion and function postoperatively.

CONCLUSIONS: Both RCR and rTSA can result in significant functional improvement and patient satisfaction in the setting of MCT without arthritis in patients older than 65. At our institution, patients who underwent rTSA had less pre-operative motion, lower function, more evidence of superior migration, and were more likely to have had previous rotator cuff surgery.

Surgical management of periprosthetic shoulder infections.

STONE GP1, CLARK RE2, O’BRIEN KC2, VACCARO L2, SIMON P2, LORENZETTI AJ3, STEPHENS BC4, FRANKLE MA5.

BACKGROUND: The treatment of periprosthetic joint infection is a difficult challenge in shoulder arthroplasty. This study investigated 1-stage modular component exchange vs. 1-stage complete removal and reimplantation (CRR) vs. 2-stage revision arthroplasty for periprosthetic joint infection.

METHODS: Between January 1, 2004, and December 31, 2012, 79 patients received a component exchange (n = 15), CRR (n = 45), or a 2-stage (n = 19) revision for infection. A binary logistic regression analysis was performed to determine factors presenting the greatest risk of reinfection. Complications and functional outcomes were also evaluated.

RESULTS: Overall, 4 of 15 (27%) component exchanges, 2 of 45 (4%) CRRs, and 4 of 19 (21%) 2-stage procedures required a reoperation for infection with a minimum of 1 year of follow-up. The difference between the CRR group and exchange group was significant (P = .030); however, the difference between the CRR group and 2-stage group did not reach statistical significance (P = .059). No preoperative and intraoperative selection bias between the groups was found. Binary logistic regression predicted that reinfection was highest in patients whose cultures grew Staphylococcus aureus (P = .004) or coagulase-negative Staphylococcus species (P = .041) or those treated with a component exchange (P = .015). The difference between groups for noninfection-related complications was not significant (P = .703). All procedures provided improved functional outcomes and pain relief.

CONCLUSION: Patients with infection caused by Staphylococcus aureus or coagulase-negative Staphylococcus species may require additional operations to treat the infection. Although effective in some cases, component exchange presents an increased risk for reinfection. A 1-stage CRR procedure had similar reinfection rates as a 2-stage procedure in our patient population.
ABSTRACT

Classification of instability after reverse shoulder arthroplasty guides surgical management and outcomes.

ABDELFATTAH A1, OTTO RJ2, SIMON P3, CHRISTMAS KN3, TANNER G1, LAMARTINA J 2ND1, LEVY JC4, CUDD DJ5, MIGHELL MA1, FRANKLE MA6.

BACKGROUND: Revision of unstable reverse shoulder arthroplasty (RSA) remains a significant challenge. The purpose of this study was to determine the reliability of a new treatment-guiding classification for instability after RSA, to describe the clinical outcomes of patients stabilized operatively, and to identify those with higher risk of recurrence.

METHODS: All patients undergoing revision for instability after RSA were identified at our institution. Demographic, clinical, radiographic, and intraoperative data were collected. A classification was developed using all identified causes of instability after RSA and allocating them to 1 of 3 defined treatment-guiding categories. Eight surgeons reviewed all data and applied the classification scheme to each case. Interobserver and intraobserver reliability was used to evaluate the classification scheme. Preoperative clinical outcomes were compared with final follow-up in stabilized shoulders.

RESULTS: Forty-three revision cases in 34 patients met the inclusion for study. Five patients remained unstable after revision. Persistent instability most commonly occurred in persistent deltoid dysfunction and postoperative acromial fractures but also in 1 case of soft tissue impingement. Twenty-one patients remained stable at minimum 2 years of follow-up and had significant improvement of clinical outcome scores and range of motion. Reliability of the classification scheme showed substantial and almost perfect interobserver and intraobserver agreement among all the participants (κ = 0.699 and κ = 0.851, respectively).

DISCUSSION: Instability after RSA can be successfully treated with revision surgery using the reliable treatment-guiding classification scheme presented herein. However, more understanding is needed for patients with greater risk of recurrent instability after revision surgery.

The influence of patient and surgeon specific factors on operative duration and early postoperative outcomes in shoulder arthroplasty.

CLARK JC1, SIMON P2, CLARK RE2, CHRISTMAS KN2, ALLERT JW1, STREIT JJ1, MIGHELL MA1, HESS A3, STONE J3, FRANKLE MA4.

BACKGROUND: Increased operative duration has been shown to have demonstrable effects on the outcomes and complications in multiple areas of orthopedic surgery. We sought to determine if patient- and surgeon-specific factors correlated to operative duration in shoulder arthroplasty. Our hypothesis was that increased surgeon and trainee volume would decrease operative times and that more complex pathology would increase operative duration.

METHODS: A retrospective review of primary and revision total and reverse shoulder arthroplasties performed at a single institution from 2012 through 2015 was performed evaluating the correlation between specific patient and surgeon factors and operative duration. The influence of operative duration on postoperative length of stay and risk of readmission within 30 days was also analyzed.

RESULTS: For surgeon-specific factors, high surgeon volume (>30 shoulder arthroplasties/year) was associated with shorter operative duration (105.9 vs. 128.3 minutes; P < .001). Progression through the fellowship academic year was found to be associated with decreased surgical times (100.7 vs. 116.5 minutes; P < .0001). Certain complex pathologic processes (reverse shoulder arthroplasty for sequelae of prior fracture, total shoulder arthroplasty for dysplastic glenoid morphology, revision surgery) showed increased operative times. Patients with postoperative readmission had a longer mean operative time (163 vs. 107.1 minutes).

CONCLUSIONS: Increased surgeon and trainee volumes were associated with decreased operative duration in shoulder arthroplasty. Patients with more complex pathology were more likely to have increased surgical times. Postoperative readmission within 30 days was associated with increased operative duration. Consideration of patient selection by surgeons to minimize operative times may reduce readmissions.
REVERSE SHOULDER ARTHROPLASTY FOR THE TREATMENT OF ROTATOR CUFF DEFICIENCY: A CONCISE FOLLOW-UP, AT A MINIMUM OF 10 YEARS, OF PREVIOUS REPORTS.

CUFF DJ1, PUPELLO DR, SANTONI BG, CLARK RE, FRANKLE MA.

We previously evaluated 94 patients (96 shoulders) who underwent reverse shoulder arthroplasty using a central compressive screw with 5.0-mm peripheral locking screws for baseplate fixation and a center of rotation lateral to the glenoid as treatment for end-stage rotator cuff deficiency. The purpose of this study was to report updated results at a minimum follow-up of 10 years. Forty patients (42 shoulders) were available for clinical follow-up. In the patients available for study, implant survivorship, with the end point being revision for any reason, was 90.7%. Since our 5-year report, 2 patients underwent revision surgery; 1 patient sustained a periprosthetic fracture 7 years postoperatively and 1 patient had a dislocation because of chronic shoulder instability at 8 years postoperatively. At a minimum follow-up of 10 years, the patients continued to maintain their improved outcome scores and range of motion, which were comparable with earlier follow-up evaluations.

LEVEL OF EVIDENCE:
Therapeutic Level IV. See Instructions for Authors for a complete description of levels of evidence.

HUMERAL BONE LOSS IN REVISION SHOULDER ARTHROPLASTY.

MCLENDON PB, COX JL, FRANKLE MA1.

Revision shoulder arthroplasty is becoming more prevalent as the rate of primary shoulder arthroplasty in the US continues to increase. The management of proximal humeral bone loss in the revision setting presents a difficult problem without a clear solution. Different preoperative diagnoses often lead to distinctly different patterns of bone loss. Successful management of these cases requires a clear understanding of the normal anatomy of the proximal humerus, as well as structural limitations imposed by significant bone loss and the effect this loss has on component fixation. Our preferred technique differs depending on the pattern of bone loss encountered. The use of allograft-prosthetic composites, the cement-within-cement technique, and combinations of these strategies comprise the mainstay of our treatment algorithm. This article focuses on indications, surgical techniques, and some of the published outcomes using these strategies in the management of proximal humeral bone loss.
Difficulty in Decision Making in the Treatment of Displaced Proximal Humerus Fractures: The Effect of Uncertainty on Surgical Outcomes.

Lamartina J 2nd1, Christmas KN2, Simon P3, Streit JJ1, Allert JW1, Clark J1, Otto RJ4, Abdel fattah A1, Mighell MA1, Frankle MA5.

Background: Decision making in the management of proximal humerus fractures can be difficult in situations in which the surgeon is uncertain of the ideal treatment.

Methods: Two shoulder surgeons operatively treated 476 proximal humerus fractures from 1998-2014 with open reduction-internal fixation (ORIF), hemiarthroplasty, or reverse shoulder arthroplasty. Operative treatment was stratified by year to determine the evolution of technological influences on treatment over time. To evaluate the effect of uncertainty, 274 clinical vignettes were created for all patients with 1 year of follow-up or more and reviewed by 3 fellowship-trained shoulder surgeons to determine the type of treatment for each case. To evaluate the effect of certainty, range of motion for each patient with unanimous agreement on treatment was analyzed.

Results: ORIF treatment increased from 40% to 62% after release of the proximal humerus locking plate. Introduction of the fracture stem in 2011 increased reverse shoulder arthroplasty for fractures from 8.8% to 44.3%. Unanimous agreement on either operative or nonoperative treatment occurred 70.5% of the time. Only 63.5% of patients received the actual treatment selected (P = .001). Patients for whom unanimous agreement matched actual treatment in the ORIF treatment group showed improvement of forward elevation (144° vs 123°, P = .005) and abduction (129° vs 103°, P = .002).

Conclusions: Successful management of displaced proximal humerus fractures requires both technical and decision-making abilities. The difficulty in making these decisions is reflected by the agreement of experienced shoulder surgeons only 63.5% of the time regarding the treatment performed. When uncertainty occurs, patients may have reduced outcomes as seen in the ORIF treatment group.

Drains Are Not Beneficial in Primary Shoulder Arthroplasty.

Frye BD, Hannon P, Santoni BG, Nydick JA.

The purpose of this study was to determine if clinical differences exist between closed drainage use in primary shoulder arthroplasty and postoperative complications. A retrospective review was performed of all primary total shoulder and reverse total shoulder arthroplasty procedures at the authors’ institution during a 2-year period. A total of 378 of 636 shoulder arthroplasty patients met inclusion criteria. Drains were used in 111 patients. The authors did not identify a significant relationship between drain use and postoperative complications. When complications were stratified just by the presence or absence of risk factors, irrespective of whether a drain was used, no significant relationship was identified. This study does not support the routine use of closed drainage systems in primary shoulder arthroplasty, including for patients with risk factors for potentially developing postoperative complications. [Orthopedics. 201x; xx(x):xx-xx].
**ABSTRACT**

**Massive Rotator Cuff Tear: When to Consider Reverse Shoulder Arthroplasty.**

SELLERS TR1, ABDELFATTAH A2, FRANKLE MA3.

**PURPOSE OF REVIEW:** The purpose of this review is to discuss the indications for reverse shoulder arthroplasty (RSA) in the management of massive rotator cuff tear (MCT), review the reported outcomes in the literature, and outline our approach and surgical technique for treating these patients.

**RECENT FINDINGS:** While RSA remains a successful and well-accepted treatment for cuff tear arthropathy (CTA), management of MCT in the absence of arthritis is controversial. In this particular setting, patients best suited for RSA are elderly, lower-demand individuals with chronic, irreparable MCT, and pseudoparalysis. Age <60, better pre-operative function and upper extremity neurologic dysfunction are potential risk factors for poor outcome with RSA in this population. Long-term follow-up studies of RSA for CTA and MCT show good functional outcomes and implant survival >90% at 10 years. Treatment of MCT must be individualized for each patient. When patient selection is optimized, RSA is a reliable means of relieving pain and improving function with excellent success. Further investigation is necessary to better define its indications and assess the role of alternative, joint-salvaging procedures.

**ABSTRACT**

**Large Diaphyseal-Incorporating Allograft Prosthetic Composites: When, How, and Why: Treatment of Advanced Proximal Humeral Bone Loss.**

MCLENDON PB1, COX JL2, FRANKLE MA3.

**BACKGROUND:** Proximal humeral bone loss in shoulder arthroplasty is a complex problem with a heterogeneous presentation. Different etiologies may contribute to varying degrees of severity in bone loss that dictate different treatment approaches.

**OBJECTIVES:** The purpose of this article is to describe our technique for treatment of proximal humeral bone loss with proximal humeral allograft prosthetic composites (APC) and identify factors that may predict when larger allografts may be necessary.

**MATERIALS AND METHODS:** Ninety-nine patients were identified that had undergone reverse total shoulder arthroplasty with use of a proximal humeral allograft. Thirty-nine of these had large allografts that involved a significant portion of the diaphysis. Preoperative characteristics were examined to identify factors that may be associated with use of a larger diaphyseal-incorporating allograft.

**RESULTS:** Well-fixed humeral stems could be treated with short metaphyseal allografts in 55 of 65 (85%) cases. Loose stems required longer diaphyseal-incorporating allografts in 28 of 31 (90%) cases, and these were commonly associated with periprosthetic fractures (n = 10), failed prior APC (n = 6), and infection (n = 5). Noncemented stems required diaphyseal grafts in 75% of cases, compared to cemented stems which required larger grafts in 34% of cases.

**DISCUSSION:** Proximal humeral bone loss in the setting of revision shoulder arthroplasty can be successfully managed with a reverse total shoulder and proximal humeral allograft. Larger allografts are frequently required for loose humeral stems, and noncemented stems appear more likely to require larger allografts than cemented stems.
Total shoulder arthroplasty with minimum 5-year follow-up: does the presence of subchondral cysts in the glenoid increase risk of failure?

TANNER G1, SIMON P2, SELLERS T3, CHRISTMAS KN4, OTTO RJ5, CUFF DJ6, ABDELFATTAH A1, MIGHELL MA1, FRANKLE MA7.

BACKGROUND: This study evaluated the effect of cystic changes in the glenoid on postoperative outcomes and implant survival after total shoulder arthroplasty (TSA).

MATERIALS AND METHODS: From 2004 to 2012, 75 patients underwent TSA for primary osteoarthritis with minimum 5-year follow-up. Preoperative 3-dimensional models based on computed tomography imaging were created for all patients. A qualitative evaluation of cystic osteoarthritis was performed through survey grading by 3 fellowship-trained shoulder surgeons. The extent of cyst formation in the glenoid (no cysts, small, medium, or large) was assigned for every patient. In addition, quantitative evaluation was performed on 3-dimensional glenoid models. Functional outcomes, radiographic findings, and the need for revision were compared between group 1 (large and medium cysts) and group 2 (small and no cysts).

RESULTS: Qualitative evaluation of cyst formation resulted in the following distribution: no cysts in 8 patients (11%), small cyst formation in 27 (36%), medium cysts in 19 (25%), and large cysts in 21 patients (28%; \( \kappa = 0.605 \)). The difference in total cyst volume between group 1 and group 2 was significant (\( P = .004 \)). The overall revision rate was 7% (5 of 75). All revised patients were in the groups with medium or large cysts. There were no statistical differences in American Shoulder and Elbow Surgeons (ASES) Standardized Shoulder Assessment scores or presence of radiographic loosening among the study groups.

CONCLUSION: Qualitative computed tomography evaluation of cystic osteoarthritis correlates with quantitative analysis of cyst volume. Severe cyst formation portends a higher risk of failure at midterm follow-up. Cystic disease did not affect functional outcome or the presence of radiographic glenoid loosening.

Shoulder Arthroplasty for Sequelae of Obstetrical Brachial Plexus Injury.

WERTHEL JD1, SCHOCH B1, FRANKLE M2, COFIELD R1, ELHASSAN BT3.

PURPOSE: Shoulder arthroplasty following obstetrical brachial plexus injury (OBPI) is technically challenging because glenoid morphology, muscle balance, and humeral version are substantially altered compared with the neurologically intact shoulder. The purpose of this study is to report the outcome of shoulder arthroplasty in a group of patients with end-stage arthritis secondary to OBPI.

MATERIALS AND METHODS: Seven patients with OBPI and secondary glenohumeral arthritis were treated with shoulder arthroplasty between 1976 and 2014. Two underwent hemiarthroplasty (HA), 2 underwent total shoulder arthroplasty (TSA), and 3 underwent reverse shoulder arthroplasty (RSA). One HA was lost to follow-up and was excluded. The remaining 6 patients (mean age, 62.5 years old at the time of surgery) were followed for a minimum of 2 years (mean, 7.5 years; range, 2-13 years) Outcome measures included pain, range of motion, and postoperative modified Neer ratings.

RESULTS: Pain improved in all shoulders. Mean forward flexion was unchanged. No shoulders treated with HA/TSA regained forward elevation above 90°, compared with 1 out of the 3 RSAs. External rotation improved from a mean of -10° to 20°. Active internal rotation decreased from L1 to L5. Immediate postoperative radiographs showed either severe posterior or posterosuperior subluxation in all 3 patients treated with nonconstrained implants.

CONCLUSIONS: Shoulder arthroplasty is an acceptable option to relieve pain in patients with symptomatic shoulder arthritis as a sequel of OBPI. However, range of motion improvements are not expected.
3D IMAGE-BASED MORPHOMETRIC ANALYSIS OF THE SCAPULAR NECK LENGTH IN SUBJECTS UNDERGOING REVERSE SHOULDER ARTHROPLASTY.
SIMON P1,2, DIAZ M1, CUSICK M3, SANTONI B1,2, FRANKLE M2,3.

Scapular notching after RSA may, in part, be related to a patient’s scapular morphology. The purpose of this study was to develop a novel 3 D measurement technique to describe infraglenoid tubercle morphometry. We hypothesize that the parameters describing infraglenoid tubercle would be normally distributed and would correlate with individual’s demographics and glenoid morphometry. A group of 110 subjects treated with RSA were evaluated. Scapular geometry was obtained from pre-operative CT scans. The scapular neck length was defined in anterior and posterior view as the orthogonal distance between the glenoid surface and (a) the point of most significant change of curvature on lateral pillar; (b) the most lateral portion of the infraglenoid tubercle. Scapular neck angle, maximum anatomical adduction angle, glenoid width, height and version were also measured. Scapular neck length measured in the anterior and posterior view were normally distributed with mean values of 17.6 ± 2.8 mm and 7.9 ± 2.5 mm, respectively. Scapular neck angle was on average 112.4 ± 10.6° and maximal adduction angle was 17.6 ± 2.8°. No significant associations between infraglenoid tubercle morphometric parameters, demographic, glenoid size or version were identified. Improved understanding of the patient-specific risk factors for scapular notching will help surgeons with pre-surgical planning and implant selection. Parametrization of the infraglenoid tubercle presented in this study showed normal distribution in the population unrelated to gender, side or demographics. The size of the infraglenoid tubercle is a unique trait, pre-operative evaluation of the scapular neck should be always warranted to decrease the incidence of post-operative notching. Clin. Anat. 31:43-55, 2018.

MORPHOMETRY OF THE HUMAN CLAVICLE AND INTRAMEDULLARY CANAL: A 3D, GEOMETRY-BASED QUANTIFICATION.
AIRA JR1, SIMON P1,2,3, GUTIÉRREZ S2,3, SANTONI BG2,3, FRANKLE MA3,4.

Midshaft clavicle fractures are a very common occurrence. The current treatment of choice involves internal fixation with superior or anterior clavicle plating, however their clinical success and particularly patient satisfaction are decreasing. The implementation of intramedullary devices is on the rise, but data describing the intramedullary canal parameters are lacking. The aim of this study is to quantify the geometry of the clavicle and its intramedullary canal, and to evaluate the effect of gender and anatomical side. This study used three-dimensional image-based models with novel and automated methods of standardization, normalization, and bone cross-section evaluation. The data obtained in this study present intramedullary canal, and clavicle diameter and center deviation parameterized as a function of clavicle length as well as its radius of curvature and true length. Results showed that both right-sided and female clavicles were shorter and thicker, but only females showed a statistically significant difference in size compared to males (p < 0.0001). The smallest clavicle and intramedullary canal diameters were seen at different clavicle lengths (45% and 52%), suggesting that the narrowest region of intramedullary canal cannot be appreciated based on external visualization of the clavicle alone. The narrowing of the intramedullary canal is of special interest because this is a potential limiting region for surgical planning and intramedullary device design. Furthermore, the location and value of maximum lateral curvature displacement is different in the intramedullary canal, implying there exists an eccentricity of the intramedullary canal center with respect to the clavicle center. © 2017 Orthopaedic Research Society. Published by Wiley Periodicals, Inc. J Orthop Res 35:2191-2202, 2017.
Biomechanical Comparison of 3 Inferiorly Directed Versus 3 Superiorly Directed Locking Screws on Stability in a 3-Part Proximal Humerus Fracture Model.

DONOHUE DM1, SANTONI BG2, STOOPS TK2, TANNER G, DIAZ MA2, MIGHELL M3.

OBJECTIVE: To quantify the stability of 3 points of inferiorly directed versus 3 points of superiorly directed locking screw fixation compared with the full contingent of 6 points of locked screw fixation in the treatment of a 3-part proximal humerus fracture.

METHODS: A standardized 3-part fracture was created in 10 matched pairs (experimental groups) and 10 nonmatched humeri (control group). Osteosynthesis was performed using 3 locking screws in the superior hemisphere of the humeral head (suspension), 3 locking screws in the inferior hemisphere (buttress), or the full complement of 6 locking screws (control). Specimens were tested in varus cantilever bending (7.5 Nm) to 10,000 cycles or failure. Construct survival (%) and the cycles to failure were compared.

RESULTS: Seven of 10 controls survived the 10,000-cycle runout (70%; 8193 average cycles to failure). No experimental constructs survived the 10,000-cycle runout. Suspension and buttress screw groups failed an average of 331 and 516 cycles, respectively (P = 1.00). The average number of cycles to failure and the number of humeri surviving the 10,000-cycle runout were greater in the control group than in the experimental groups (P ≤ 0.006).

CONCLUSION: Data support the use of a full contingent of 6 points of locking screw fixation over 3 superior or 3 inferior points of fixation in the treatment of a 3-part proximal humerus fracture with a locking construct. No biomechanical advantage to the 3 buttress or 3 suspension screws used in isolation was observed.
With the most comprehensive and advanced sports medicine program in the region, doctors from Florida Orthopaedic Institute have served as the team physicians for the Tampa Bay Buccaneers, Tampa Bay Lightning, Tampa Bay Mutiny, Tampa Bay Rowdies, Tampa Bay Storm, Saint Leo University and many high schools throughout Hillsborough County.

Knee Creations SCP® Observational Cohort Follow-Up Study (PI: Baker)

A Randomized Controlled Trial of the Subchondroplasty Procedure with Arthroscopy versus Arthroscopy Alone for Treatment of Bone Marrow Lesions in the Knee (PI: Baker)

FLORIDA ORTHOPAEDIC INSTITUTE SPORTS MEDICINE SURGEONS

Dr. Adam Morse, Dr. Seung Yi;
Back Row (l to r) Dr. Seth Gasser
THE MOST ADVANCED TREATMENT FOR SPORTS-RELATED INJURIES

Using a multi-disciplinary approach to ensure the most innovative treatment for all sports-related injuries, most surgery is performed on an outpatient basis. However, when multi-ligamentous injuries, significant fractures, or those associated with vascular problems arise, surgery is performed at a local hospital.

Additionally, the Sports Medicine program is associated with both the Athletic Training Program and the Sports Medicine and Related Trauma (SMART) Program within the USF Department of Orthopaedic Surgery. These programs are designed to protect the high school athlete through supervision, rehabilitation and education. Using data collected from the covered high schools, research is published and used to evaluate and develop newer methods of injury prevention.

Overall the combined program offers a comprehensive method to address all aspects of sports-related injuries with a multi-disciplinary approach, not found anywhere else in Tampa Bay.
To offer the best possible level of spine care for patients, the Center for Adult Spinal Disorders at Florida Orthopaedic Institute is a unique center of excellence dedicated to the treatment of the spine.

Spine specialists of Florida Orthopaedic Institute focus on prevention, restoration of function, reduction in pain, and control of costs in developing any treatment for back pain. Education, exercise, medication, ultrasound, heat, massage, and chiropractic therapies are applied as nonsurgical options to relieve spine pain. The majority of patients can be successfully treated with physical therapy and medical management. If nonsurgical approaches are not effective, the latest advancements in state-of-the-art spine surgery are offered.
MINIMALLY INVASIVE SPINE SURGERY
Patients that suffer chronic back pain from certain spine conditions, and who have been unresponsive to nonsurgical treatments may be considered candidates for minimally invasive spine surgery.

Minimally invasive spine surgery combines technological advances with state-of-the-art practices that reduce both the size of the incision as well as the hospital stay. Many patients are able to have the surgery performed in an outpatient setting. Minimally invasive spine surgery typically involves fewer risks than open spine surgeries.

ANTERIOR CERVICAL DISCECTOMY WITH FUSION (ACDF)
The fellowship trained surgeons of Florida Orthopaedic Institute routinely perform ACDF surgery, designed to relieve spinal cord or nerve root pressure in the neck by removing all or part of a damaged disc. After all or part of the damaged disc is removed, a bone graft or a cage is inserted into the space where the disc used to be. This prevents the disc space from collapsing and allows the bone to grow together to set up a bony bridge, or fusion, between the upper and lower vertebrae. A small metal plate is affixed to the front of the upper and lower vertebrae to provide stability while the bone fusion heals together, a process that can take up to 18 months.

LUMBAR SPINE SURGERY
Florida Orthopedic Institute spine surgeons are trained in both minimally invasive and open procedures. The most common conditions that may require surgery in the lumbar spine are spinal stenosis, disk herniations, and spondylolisthesis (abnormal motion between bones causing compression of nerves). These three common conditions can be treated by both minimally invasive and traditional open procedures. These procedures range from a laminectomy, which is the removal of bones and tissue that can cause compression of the spinal canal, to fusion procedures that are usually required if there is abnormal motion between bones or if the amount of bone removed could cause abnormal motion. Fusion procedures can be performed from a minimally invasive method from the back, side, or through the abdomen; or with traditional midline open incisions in the low back. The fusions procedures typically include use of an interbody cage which enhances fusion rates as well as aids in the decompression of nerves.

DEFORMITY SURGERY/ADULT SCOLIOSIS
Florida Orthopaedic Institute spine surgeons are also trained in various acquired spinal deformities which can cause a significant amount of patient morbidity if left untreated. These can range from scoliosis that was present in childhood and then progressed later in life, to gradual deformities acquired as patients age, or deformities caused by prior spine surgery. Open procedures are typically required with pedicle screws and rods to aid in placing the patient in a better position to maintain a horizontal gaze. Occasionally, osteotomies in the bone are required to obtain the necessary correction. Minimally invasive techniques are sometimes used to spare the patient the risk of an osteotomy with the insertion of interbody cages.
ACUTE LUMBAR PARASPINAL MYONECROSIS IN FOOTBALL PLAYERS WITH SICKLE CELL TRAIT: A CASE SERIES.

EICHNER ER1, SCHNEBEL B, ANDERSON S, CLUGSTON JR, HALE MH, MICHAUDET C, SMALL JM.

We report six cases of a novel syndrome of acute, exertional low back pain in football players, five in college and one in the National Football League. All six are African Americans with sickle cell trait (SCT). The acute low back pain is severe and can be disabling, and the condition can be confused with muscle strain, discogenic pain, stress fracture, or other problems in athletes. Our evidence shows that this syndrome is caused by lumbar paraspinal myonecrosis (LPSMN), which likely often contributes to the lumbar paraspinal compartment syndrome. We explain why we believe SCT is a risk factor for LPSMN in football conditioning/training, although SCT is not requisite for this syndrome, which has been reported rarely in other sports (e.g., snow or water skiing) and especially in weight lifting that targets lumbar muscles. The clinical course of LPSMN in football can be mild and allow return to play in a week or two, or it can be severe and lead to long-term sequelae. Knowledge of this syndrome will enable athletic trainers and team physicians to diagnose it early, treat it properly, and lessen its effect. Further research will help us learn how better to prevent it.
Adult Reconstruction Surgery

Florida Orthopaedic Institute surgeons lead the way with minimally invasive arthroscopic hip surgery, robotic assisted total knee and hip replacement, tibial trial sensor technology and other cutting-edge orthopaedic techniques. They perform thousands of successful hip and knee joint arthroplasties – 4,422 Adult Reconstruction Cases in 2017.
HIP PRESERVATION SURGERY
Technologies and procedures for care and repair of the hip have evolved significantly in recent years. If oral medication and physical therapy are not effective, patients are now offered the latest advanced technique - hip arthroscopy. For patients with pain related to torn or loose cartilage, or early arthritis with bone impingement, minimally invasive arthroscopic hip surgery is an excellent option which is performed as an out-patient procedure, through one or two small incisions. In many cases, arthroscopic treatment can minimize or significantly delay the need for a hip replacement. The specialists of Florida Orthopaedic Institute are among only a handful within the state of Florida qualified to provide this state-of-the-art therapy.

PRIMARY HIP & KNEE ARTHROPLASTY SURGERY
The arthritis specialists of Florida Orthopaedic Institute use numerous methods to treat arthritis depending on its severity including activity modification, exercise programs, and oral medications to manage milder forms of the disease. For more moderate forms of the disease, cutting-edge regenerative techniques including platelet rich plasma, and stem cell injections are offered to minimize the pain associated with the disease. When the hip or knee joint is either too arthritic, deformed, or both, a variety of replacement options are available, including total hip, partial hip, and total knee replacements.

Hip and knee replacements are one of the most successful operations ever developed, with patient satisfaction rates typically in excess of 90%. Florida Orthopaedic Institute surgeons perform thousands of these joint replacements each year. All have received Fellowship training in their specialty, from some of the world’s best universities and research centers, and now teach younger surgeons these same techniques, lecturing nationally and throughout the world.

These same surgeons have pioneered many of the operative procedures, and designed the very implants used to replace the hip and knee joints. All are board certified and recertified. As a result, these surgeons consistently use the most advanced techniques available, making them leaders in their field.

SAME DAY OUTPATIENT HIP & KNEE JOINT SURGERY
Florida Orthopaedic Institute surgeons have helped pioneer outpatient joint replacement, where patients can go home the same day as the surgery. Traditionally, patients have been admitted to the hospital for a period of two to four days. But with team control, excellent anesthesia, and surgeon expertise, same day replacements can be performed on selected patients. Patients come in an hour before the operation, have surgery, usually stay between three to four hours in the recovery unit, and then go home.

ROBOTIC JOINT REPLACEMENT SURGERY
One recent technique that the Florida Orthopaedic Institute Joint Replacement team has helped pioneer is the Mako® robotic-assisted surgery. This technology helps with the removal of diseased bone while preserving healthy bone and assists the surgeon in the ideal positioning of the implant, based on the patient’s anatomy. Mako technology provides surgeons with patient-specific 3-D models to pre-plan hip and knee replacements. Surgeons guide the Mako robotic arm during surgery, based on a patient-specific plan.

REVISION JOINT REPLACEMENT SURGERY
As high volume joint replacement surgeons, the Florida Orthopaedic Institute team has a tremendous understanding of the problems associated with failed surgery. This expertise has resulted in exceptional experience in solutions for infected joints, loose implants, complex deformities, fractures around these implants, and patients with metabolic bone problems. As one of the leading revision hip and knee centers in the United States, Florida Orthopaedic Institute surgeon’s expertise has restored many failed joint replacements so patients may successfully return to a normal lifestyle.

SENIOR STRONG
The SENIOR STRONG program, created by Florida Orthopaedic Institute, proactively provides seniors with key fitness techniques to maintain healthy and active lifestyles by decreasing falls and increasing energy levels to prevent hip fractures. This groundbreaking preventative treatment program helps incorporate lower extremity resistance strength exercises, balance exercises, and functional movements and is customized to each patient.

On the Leading Edge
FOI joint arthroplasty surgeons are using:

- Robotic-assisted total knee replacement, leading the application team, the IDE study for FDA approval, and as part of initial limited release surgeon group
- Second generation robotic partial knee replacement, leading the application team and part of the initial limited release surgeon group
- Robotic-assisted total hip replacement
- Tibial trial sensor technology for total knee soft tissue balancing
- Anterior-based muscle sparing approach for total hip permitting accelerated recovery
- Short femoral implant component for total hips
- Radiofrequency ablation for knee pain (genicular nerves) via novel technique
- Kinematic total knee arthroplasties (pilot center)
- Custom total knee arthroplasty implantations

Dr. Thomas L. Bernasek serving as President of Hillsborough County Medical Association

Dr. Steven Lyons serving as Vice President of the Florida Orthopaedic Society

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A Targeted Approach to Ligament Balancing Using Kinetic Sensors.

GUSTKE KA1, GOLLADAY GJ2, ROCHE MW3, ELSON LC4, ANDERSON CR4.

BACKGROUND: Currently, soft-tissue imbalance contributes to several of the foremost reasons for revision following primary TKA, including instability, stiffness, and aseptic loosening. In order to decrease the incidence of soft-tissue imbalance, intraoperative sensors were developed to provide real-time, quantitative load data within the knee. This study examines the intraoperative data of a group of multicenter patients to determine how targeted ligament releases affect intra-articular loading, and to understand which types of releases are necessary to achieve quantified ligament balance.

METHODS: A group of 129 patients received sensor-assisted TKA, as part of a multicenter study. Medial and lateral loading data were collected pre-release, during any sequential releases, and post-release. All data were collected at 10°, 45°, and 90° during range of motion testing. Ligament release type, release technique type, and resultant loading were collected.

RESULTS: Loading across the joint decreased, overall, and became more symmetrical after releases were performed. On average, between 2 and 3 corrections were made (up to 8) in order to achieve ligament balance. The ligament release type and subsequent quantified change in loading were in agreement with historical, qualified sources.

CONCLUSION: Objective data from sensor output may assist surgeons in decreasing loading variability and, thereby, decreasing ligament imbalance and its associated complications.

All-Polyethylene Tibial Component Use for Elderly, Low-Demand Total Knee Arthroplasty Patients.

GUSTKE KA1, GELBKE MK2.

BACKGROUND: Potential advantages combined with lower cost have prompted a renewed interest in modern all-polyethylene tibial designs.

METHODS: A total of 317 Natural Knee total knee arthroplasties with an all-polyethylene tibial component that was performed since 1993 were retrospectively reviewed to confirm that cost savings were not associated with inferior clinical results. They were primarily used in elderly, low-demand patients. The average age at the time of surgery was 80.8 years.

RESULTS: 227 knees with a minimum of 2-year follow-up were identified. The average follow-up was 5.6 years (range, 2-20 years). Clinical and radiographic outcomes were evaluated. At the latest follow-up, the average Knee Society and functional score was 94.2 and 57.2. The average postoperative range of motion was 1.6°-115.4°. No patient required a revision for aseptic or septic loosening, wear, or instability. Only 5 knees had a partial non progressive cement/bone radiolucency. There was an approximate 33% cost savings for the implants when the all-polyethylene component was used.

CONCLUSION: An all-polyethylene tibial component of this design provides excellent results in the elderly population along with a significant cost savings.
Complete Eradication of Biofilm From Orthopedic Materials.

LEARY JT1, WERGER MM1, BROACH WH2, SHAW LN2, SANTONI BG3, BERNASEK TL1, LYONS ST1.

BACKGROUND: Interest Exists In Finding Alternatives To Current Management Strategies In Periprosthetic Joint Infections, Which Typically Include A 2-Stage Revision With Placement Of An Antibiotic Spacer And Delayed Placement Of A New Implant. We Studied The Efficacy Of Autoclaving, Ultrasonication, And Mechanical Scrubbing For Sterilization And Biofilm Eradication On Infected Cobalt-Chrome Discs.

METHODS: Strains of Staphylococcus aureus MRSA252 or Staphylococcus epidermidis RP62A were grown on the discs. For each strain, discs were divided into 5 groups (5 discs each) and exposed to several sterilization and biofilm eradication treatments: (1) autoclave, (2) autoclave + sonication, (3) autoclave + saline scrub, (4) autoclave + 4% chlorhexidine (CHC) scrub, and (5) autoclave + sonication + CHC scrub. Sterilization and biofilm eradication were quantified with crystal violet assays and scanning electron microscopy.

RESULTS: Relative to nontreated controls, autoclaving alone reduced biofilm load by 33.9% and 54.7% for MRSA252 and RP62A strains, respectively. Biofilm removal was maximized with the combined treatment of autoclaving and CHC scrub for MRSA252 (100%) and RP62A (99.5%). The addition of sonication between autoclaving and CHC scrubbing resulted in no statistically significant improvement in biofilm removal. High-resolution scanning electron microscopy revealed no cells or biofilm for this combined treatment.

CONCLUSION: Using 2 commonly encountered bacterial strains in periprosthetic joint infection, infected cobalt-chrome discs were sterilized and eradicated of residual biofilm with a combination of autoclaving and CHC scrubbing.

WEBB JE1, MCGILL RJ2, PALUMBO BT3, MOSCHETTI WE4, ESTOK DM5.

BACKGROUND: Treatment of massive acetabular bone loss in revision total hip arthroplasty is complex, and various treatment strategies have been described. We describe a novel technique of using a Trabecular Metal Revision Shell as a buttress augment creating a “double-cup” construct rather than the use of custom triflanges or cup-cage constructs for Paprosky types IIIA and IIIB acetabular defects.

METHODS: We retrospectively reviewed 20 double-cup cases at a mean of 2.4 years follow-up at a single institution between 2005 and 2014. We evaluated postoperative radiographic evidence of acetabular loosening and complication rates, restoration of hip center of rotation, preoperative and postoperative modified Harris Hip Score, and Merle d'Aubigne-Postel pain and walking scores.

RESULTS: There were no revisions for acetabular loosening and no cases of aseptic loosening. We observed a 25% dislocation rate, which was the most common complication. Most dislocations occurred within the first year after surgery and most were acetabulum only revisions. Hip center of rotation was restored to an average of 22.5 mm within the interteardrop line. Average Harris Hip Score improved from 28.2 to 68.7 (P < .001) and Merle d'Aubigne-Postel pain and walking scores improved from 2.7 to 5.1 and 2.4 to 4, respectively (P < .001).

CONCLUSION: The double-cup construct is a reliable option for reconstruction of Paprosky type IIIA and IIIB acetabular defects with no cases of acetabular loosening both clinically and radiographically at a mean of 2 years follow-up. The most common complication was dislocation in the acetabulum-only revisions, and clinical outcome measures were reliably improved in surviving cases.
COMPUTER NAVIGATION AND DISTAL FEMORAL RECONSTRUCTION IN THE ONCOLOGIC PATIENT.

PALUMBO BT1, HENDERSON E2, RIZER J3, LETSON DG3, CHEONG D3.

OBJECTIVES: As adjuvant treatments for musculoskeletal malignancies improve expectations of preserved function increase. We questioned whether computer navigation for distal femoral reconstruction would improve outcomes.

METHODS: Twenty oncology patients were reviewed after distal femoral reconstruction using navigation. Outcomes included local recurrence, implant revision, patient function, patellofemoral complications and leg-length inequality.

RESULTS: Implant survivorship was 85% at 26 months. There were no local recurrences and 3 failures for aseptic loosening. Good functional outcomes were observed in remaining cases.

CONCLUSION: Computer navigation for distal femoral reconstruction resulted in acceptable functional outcomes and implant survivorship. Reduced local recurrence were observed at intermediate follow-up. Level of Evidence: Level IV.
Soft Tissue Releases in Total Knee Arthroplasty for Valgus Deformities.

XIE K1, LYONS ST1.

BACKGROUND: Primary total knee arthroplasty (TKA) for valgus knee deformities can be challenging. Soft tissue releases are often necessary to achieve a well-balanced knee. We reviewed the frequency of soft tissue releases including lateral retinacular release (LRR) as it pertains to preoperative limb alignment. Postoperatively, we evaluated limb alignment, knee range of motion, and complications.

METHODS: From 2010 to 2016, 214 primary TKAs with valgus deformity were performed by a single surgeon. One hundred eighty-one patients had an average follow-up of 24 months. For these patients, clinical data including preoperative and postoperative range of motion, complications, and revision rates were collected. Soft tissue releases, preoperative and postoperative limb axis deviation, and level of prosthetic constraint were recorded in all patients regardless of length of follow-up.

RESULTS: There were 33 knees (15%) that required 1 release, 69 knees (32%) required 2 releases, 81 knees (38%) required 3 releases, and 31 knees (14%) that required 4 or more releases. The average preoperative mechanical axis was 9.4°, and the average postoperative mechanical axis was 0.13°. There were 85 knees (40%) that required an LRR. Increased severity of preoperative deformity correlated with the need for more soft tissue release, but did not correlate with the need for LRR. No knees were revised for instability. No patella complications resulted from LRR.

CONCLUSION: Selective soft tissue release for primary valgus TKA was effective without increasing prosthetic constraint. Severe deformities required more soft tissue releases. LRR can be frequently used with minimal complications.
PCL-DEFICIENT CRUCIATE RETAINING TOTAL KNEE REPLACEMENTS WITH A CONTEMPORARY TOTAL KNEE SYSTEM: HOW DO THEY COMPARE TO A POSTERIOR STABILIZED TOTAL KNEE AT TWO YEARS?

T. KYLE STOOPS, MD, THOMAS L. BERNASEK, MD

BACKGROUND: A posterior cruciate ligament (PCL) deficient knee is frequently encountered during total knee replacement (TKR). Surgical options for this situation include the use of a cruciate-retaining (CR) TKR with a highly conforming polyethylene or a posterior cruciate substituting (PS) implant which relies on a cam-post articulation. This study evaluated the results of a PCL deficient TKR in a matched set of patients using CR vs PS replacements followed for a minimum two years follow-up.

METHODS: A group of 100 PCL-deficient patients underwent TKR and included 54 CR and 46 PS subjects were evaluated at two years with Knee Society Scores for pain and function, passive range of motion and functional (squatting) range of motion. Complications and manipulations were documented.

RESULTS: Average passive range of motion was similar in both groups: CR v PS = 121° v 121° (p value 0.757) as was the functional (squatting) range of motion: CR v PS = 106° v 102° (p value 0.508). Both CR and PS postoperative pain and function Knee Society Scores (KSS) were significantly improved from preoperative values (p < 0.001 for both). The postoperative CR and PS KSS pain and function scores were not significantly different (function p value = 0.102; pain = 0.440).

CONCLUSION: Both PS and PCL def CR knees had significantly improved clinical outcomes at 2 years. No difference in clinical outcome, knee passive or functional (squatting) ROM or KSS at 2 years postoperatively.
With over 20 years of experience, performing thousands of ankle fusions, triple arthrodeses, subtalar fusions and over 300 total ankle replacements, our surgeons are leaders in the field. Over 1,000 procedures were done in 2017 alone.

Since 1989, Florida Orthopaedic Institute surgeons have helped thousands of patients get back on their feet with Tampa Bay’s most advanced orthopedic lower extremity service. Knowledgeable and experienced physicians, therapists and nurses work in concert to cover the total spectrum of foot and ankle musculoskeletal care.
CONSERVATIVE MANAGEMENT BEFORE SURGERY

Whether tendon, ligament, bone injuries, arthritis, or acute/chronic conditions, Florida Orthopaedic Institute surgeons are fellowship trained and have extensive knowledge in the management of all conditions affecting this region of the body. Thankfully, many of these problems require conservative management before requiring surgery. Shoe modifications, bracing, physical therapy, and medications are only a part of what is offered.

When surgery is indicated, the operative experience of the surgeon is critical. With the largest combined experience in Florida, the Florida Orthopaedic Institute team has performed tens of thousands of these procedures including flat foot corrections, ankle and subtalar fusions, midfoot osteotomies, bunion surgery, soft tissue reconstructions, as well as fracture reconstruction.

FRAC TURE SURGERY

The foot and ankle surgeons are well respected fracture specialists, managing the most complex of these problems with a national and international reputation. In addition, the devices used to treat these injuries (plates, screws and intramedullary nails) have been developed by members of the team. This expertise is unique in the region and allows for managing problems with predictable outcomes, as well as teaching others through courses, lectures, and publications.

ANKLE ARTHRITIS

Unfortunately, this is a rather common problem and requires careful management to maintain motion while minimizing pain. The first line of treatment remains oral medications, but stem cell injections are frequently used by the staff to minimize the inflammation within the ankle that causes the pain. When this is not effective, arthroscopy may be used to remove irritating tissue.

These minimally invasive procedures are designed to prevent the need for an open procedure. However, when arthritic pain and deformity prevents patients from maintaining a normal lifestyle, either a fusion or an ankle replacement is required.

TOTAL ANKLE REPLACEMENT

In 1995, the Agility® total ankle prosthesis became available in the U.S. Tampa General was the third center in the country to implant this device, with Florida Orthopaedic surgeons involved in design, teaching, and evaluation of the implant. Later that year a European ankle known as the S.T.A.R.® was released, and again Florida Orthopaedic surgeons were involved in the first trial of that prosthesis in the U.S.

Since that time, Florida Orthopaedic Institute surgeons (all trained on total ankle replacements) have performed hundreds of replacements. With over 20 years of experience, the foot and ankle surgeons of Florida Orthopaedic Institute remain leaders in the field.

Finally, for those patients that are not candidates for an ankle replacement, ankle fusions remain the gold standard. Patients can walk without a limp using modern techniques to remove minimal amounts of bone and position the ankle so the joint below moves well.

REVISIONS & REFERRALS

Because of the combined expertise of the foot and ankle surgeons, as well as their national reputation, patients are referred not only locally, but from all over the country. Many of the referrals are patients with significant post-surgical complications including infections, failed joint replacements, poorly positioned fusions, and non-healed fractures. These patients are sent to the Center for definitive solutions to their problems, and in most cases the Florida Orthopaedic surgeons are able to improve their lives. This ability to solve complex problems and help patients is the driving force behind maintaining the high quality of care offered, and why Florida Orthopaedic Institute is a regional and national referral center. Patients from all across the nation are referred because of the combined expertise and reputation.

Over 1,164 Foot & Ankle Cases were performed in 2017.
Intermediate-term Experience With the STAR Total Ankle in the United States.

Loewy EM1, Sanders TH2, Walling AK3.

BACKGROUND: Limited intermediate and no real long-term follow-up data have been published for total ankle arthroplasty (TAA) in the United States. This is a report of clinical follow-up data of a prospective, consecutive cohort of patients who underwent TAA by a single surgeon from 1999 to 2013 with the Scandinavian Total Ankle Replacement (STAR) prosthesis.

METHODS: Patients undergoing TAA at a single US institution were enrolled into a prospective study. These patients were followed at regular intervals with history, physical examination, and radiographs; American Academy of Orthopaedic Foot and Ankle Surgeons (AOFAS) Ankle-Hindfoot Scale scores were obtained and recorded. Primary outcomes included implant survivability and functional outcomes scores. Secondary outcomes included perioperative complications such as periprosthetic or polyethylene fracture. Between 1999 and 2013, a total of 138 STAR TAAs were performed in 131 patients; 81 patients were female. The mean age at surgery was 61.5 ± 12.3 years (range, 30-88 years). The mean duration of follow-up for living patients who retained both initial components at final follow-up was 8.8±4.3 years (range 2-16.9 years).

RESULTS: The mean change in AOFAS Ankle-Hindfoot scores from preoperative to final follow-up was 36.0 ± 16.8 (P < .0001). There were 21 (15.2%) implant failures that occurred at a mean 4.9 ± 4.5 years postoperatively. Ten polyethylene components in 9 TAAs (6.5%) required replacement for fracture at an average 8.9 ± 3.3 years postoperatively. Fourteen patients died with their initial implants in place.

CONCLUSION: This cohort of patients with true intermediate follow-up after TAA with the STAR prosthesis had acceptable implant survival, maintenance of improved patient-reported outcome scores, and low major complication rates.

Lisfranc Injuries.

Clare MP1.

PURPOSE OF REVIEW: The purpose of this review is to discuss key anatomic and pathoanatomic factors, treatment principles, and patient outcomes of Lisfranc injuries.

RECENT FINDINGS: Although open reduction and internal fixation (ORIF) remains the current gold standard of treatment, ORIF with primary arthrodesis has become increasingly popular in recent years, both for pure ligamentous and for bony-ligamentous injuries. Return to activity and competitive sports as well as overall patient outcomes have been further defined, suggesting that most patients are able to return to near pre-injury level if properly diagnosed and appropriately treated. Considerable controversy remains as to the optimal method of treatment of Lisfranc injuries and may ultimately be defined by activity-specific or sport-specific criteria.
ACUTE MANAGEMENT OF HIGH-ENERGY LISFRANC INJURIES: A SIMPLE APPROACH.
HERSCOVICI D JR1, SCADUTO JM2.

INTRODUCTION: The aims of this study were to (1) describe the use of the K-wire for the initial management of high-energy Lisfranc dislocations or fracture dislocations, (2) to evaluate whether this standalone technique allowed for adequate reduction of these injuries, (3) to evaluate whether reductions were maintained until definitive fixation was performed, (4) and to determine if it contributed to any increase in complications prior to or after definitive fixation.

PATIENTS AND METHODS: A retrospective review was performed on all patients who presented with tarsometatarsal injuries from January 2005 through June 2015. Dislocations of the tarso-metatarsal joints were classified as either Type A (total incongruity, homolateral complex), Type B (partial incongruity, homolateral incomplete) or Type C (divergent, total or partial displacement) patterns, with or without associated fractures. For the purposes of this paper, high-energy injuries were defined as patients presenting with either a Type A or Type C (total displacement) dislocations or fracture-dislocation patterns. A total of 176 patients presented with a tarsometatarsal injury. Eighteen patients with divergent or homolateral patterns underwent a staged approach. Fifteen patients were managed exclusively with K-wire fixation. Wound complications, infections or the unexpected need to return to surgery were recorded.

RESULTS: All patients demonstrated an improved alignment using K-wires. There were no compartment syndromes, vascular insufficiency, complications to the skin associated with traction or manipulation, or pin site infections. At definitive fixation, no patient demonstrated a loss in the alignment that had been obtained at the index procedure or had an unexpected return to surgery.

DISCUSSION & CONCLUSIONS: This study demonstrates that high-energy Lisfranc injuries are uncommon and that K-wires are a simple and adequate technique that can be used for initial staged approach of these injuries. The use of 2.0mm K-wires were sufficient to obtain and maintain the reduction until definitive fixation has been obtained, without producing any increase risk for complications.

MANAGING COMPLICATIONS OF CALCANEUS FRACTURES.
CLARE MP1, CRAWFORD WS2.

Calcaneus fractures remain among the most complicated fractures for orthopedic surgeons to manage because of the complexity of various fracture patterns, the limited surrounding soft tissue envelope, and the prolonged rehabilitation issues impacting function after successful treatment. Despite this, appropriate management of complications associated with calcaneus fractures is critical for the complete care of this injury, whether treated operatively or nonoperatively. The authors present the common complications encountered with fractures of the calcaneus and management thereof.
Hand and wrist surgery performed by Florida Orthopaedic Institute fellowship trained surgeons provides treatment for complex fractures, ligamentous, nerve, and arthritis surgery as well as reconstruction, including free tissue transfers and limb replantation. The team consists of surgeons who are all board certified in orthopaedic surgery, have fellowship training in hand surgery, and have a certificate of added qualifications (CAQ) in hand surgery - the highest level of achievement in this discipline.

Additional training allows our surgeons to excel in microvascular surgery, with extensive experience in the replantation of fingers, thumbs, and hands. Active researchers, teachers, and educators, these surgeons train residents, Fellows and other orthopaedic surgeons through their lectures, courses, and publications.
**FRACTURE SURGERY**
As the staff that have managed the Upper Extremity Fracture Service at Tampa General Hospital for over 25 years, the team treats all the injuries sent to the Level I Trauma Center - the only Level I Trauma facility in the region. This includes injuries to bone, ligament, tendons, nerves, and joints sustained in car, boat, and motorcycle accidents, work-related accidents, including finger and hand amputations, infections and crush injuries.

**RECONSTRUCTION**
Arthritis of all kinds, both due to wear and tear, as well as the rheumatoid type, are effectively treated with fusions, osteotomies and deformity correction. Whenever possible, joint replacements including partial and total wrist replacement are offered to correct problems associated with this disease.

Over 2,428 Hand & Wrist Cases were completed in 2017.
Intraarticular Distal Radius Fracture Open Reduction Internal Fixation.

NYDICK JA1, STREUFERT BD, STONE JD.

PURPOSE: Intraarticular distal radius fractures are often treated with open reduction and internal fixation (ORIF) through a volar approach. This common approach, however, is technically demanding to restore the articular surface of the radiocarpal joint while respecting soft tissue integrity. The purpose of this video is to demonstrate the surgical technique of volar plate fixation of an intraarticular distal radius fracture.

METHODS: A 32-year-old patient who sustained multiple injuries including an intraarticular distal radius fracture was treated with ORIF by a volar approach.

RESULTS: Exposure is performed through a standard flexor carpi radialis approach. The intraarticular fracture of the distal radius is reduced, and a volar plate is applied. Careful measurement of screw length is described in detail to minimize postoperative tendon irritation. Closure of the soft tissues is completed and early postoperative rehabilitation is emphasized.

DISCUSSION: Multiple, varied techniques for fixation of intraarticular distal radius fractures are described in the literature. As demonstrated in this video of ORIF with a volar plate, attention to articular reduction, soft-tissue protection, and postoperative rehabilitation are key components used to achieve good clinical outcomes.

ONGOING CLINICAL STUDIES

A Multi-Center Registry Study of Advance Nerve Graft Utilization, Evaluation and Outcomes in Peripheral Nerve Injury Repair, or RANGER (PI: Nydick)

A Multicenter, Prospective, Randomized, Subject and Evaluator Blinded Comparative Study of Nerve Cuffs and Advance Nerve Graft Evaluation Recovery Outcomes for the Repair of Nerve Discontinuities (RECON) (PI: Nydick)

Prospective, Observational Clinical Investigation of the Exos Reformable Brace for Conservatively Managed Distal Radius Fractures: An Evaluation of Time to Union, Satisfaction, and Convenience (PI: Nydick)
Multiple reconstruction techniques have been described for correction of boutonniere deformities including direct repair, central slip reconstruction, lateral band reconstruction, transverse retinacular ligament reconstruction, staged reconstruction, and extensor tenotomy. Each technique has been reported to have variable results with complications including capsular contracture, loss of proximal interphalangeal flexion, and residual deformity. We describe a surgical technique for central slip reconstruction using a slip of the flexor digitorum superficialis tendon through a bone tunnel.
Founded in 1999 by the surgeons at the Florida Orthopaedic Institute, FORE is a 501(c)(3) non-profit organization established as a way to improve the care of patients with musculoskeletal disorders through research and education. While FORE operates independently from Florida Orthopaedic Institute, there is constant collaboration with the surgeons on numerous research and education endeavors.

The clinical research department conducts orthopaedic clinical trials in such subspecialties as hand, foot, ankle, knee, hip, spine, elbow, shoulder, and sports medicine.

This orthopaedic outcome-based research includes:
- IDE (Investigational Device Exemption) Studies
- IND (Investigational New Drug) Studies
- Industry-Sponsored Studies
- Investigator-Initiated Studies
- Randomized, Controlled Trials
- Case Studies
- Access to Florida’s largest orthopaedic group

FORE also provides full-service clinical trial management strategies:
- Experimental Design/ Protocol Development
- IRB Management
- Patient Recruitment
- Data Management
- Statistical Support and Data Analysis
- Medical Writing of Manuscripts and Abstracts
- Presentation Development

FORE’s Phillip Spiegel Orthopaedic Research Laboratory conducts high quality translational and basic science research that significantly contributes to the knowledge base, resulting in advancements in clinical applications in orthopaedics.

FORE facilitates the collaboration between different subspecialties of biomedical engineers and physicians to perform various biomechanical evaluations including synthetic bone testing, cadaver testing, computer simulations and finite element modeling.

FORE partners with industry, research and educational foundations, and orthopaedic associations and societies to conduct basic science and translational research:
- Investigating how various orthopaedic disease states affect musculoskeletal function.
- Developing and biomechanical evaluating of promising new orthopaedic devices and technologies.

Completed and published studies demonstrate research expertise in the general area of in vitro biomechanical testing. Projects range from strength testing of various fracture fixation devices in the knee, hip, shoulder, and elbow to kinematic range of motion analysis of human cadaveric lumbar and cervical spine fusion and arthroplasty constructs. The laboratory is also heavily involved in biomechanical projects that further the understanding of total and reverse shoulder arthroplasty, and the resultant effects that these techniques impart on the kinematics and kinetics of the shoulder.

FORE is improving orthopaedic medicine through investigation, innovation and education.
Florida InnoVation and Education (FIVE) Labs

Florida InnoVation and Education (FIVE) Labs is an innovative facility for biomechanical and clinical research. This 15,500-sq. ft. facility is centrally located only two miles from Tampa International Airport (TPA).

The Bioskills Lab has over 3,600 sq. ft. of lab space that can be customized for small or large events. The lab is fully equipped for up to 30 surgical stations with monitors and cameras throughout. Additionally, live feed video can be displayed throughout the facility or streamed over the web, allowing viewers to watch the event in progress. The experienced team of professionals at FIVE Labs offers concierge level service to ensure seamless and successful events.

The Prototype Lab is designed to function as a 1-2 station bioskills lab and innovation hub. It is easy to create an intimate experience with the closure of the garage door. The Prototype Lab has direct access to the board room to increase the efficiency of engineering, design review, and product development labs. The Prototype Lab features two surgical stations, HD video/audio recording and a floor-to-ceiling dry-erase wall to aid and capture the creative process.

The FIVE Labs Conference Center can accommodate large multi-day conferences, demo sessions for individual surgeons, sales training events, or team brainstorming meetings. In addition, FORE is an ACCME accredited provider of continuing medical education for physicians. The in-house team of CME Coordinators/Event Planners provides accreditation, education, and conference management services for over 40 courses annually.

Engineers at FIVE Labs work hand-in-hand with surgeons and medical device professionals to develop new and innovative medical ideas. They have the experience to take these ideas from concept to prototype to final product. The studio offers rapid 3D prototyping (plastic and metal), 3 and 5 Axis CNC machining, development of 3D CAD models and drawings, provisional and full utility patenting and initial FDA documentation.

In 2018, FIVE labs opened a 2nd facility in the Midwest, due to demand. The FIVE Labs Midwest location is less than 5 minutes from Cincinnati/Northern Kentucky International Airport and also has an auditorium, a flexible pre-function area, a dividable classroom, and a catering kitchen, all housed in a 15,000 sq. ft. facility.

The Bioskills lab has over 3,300 sq. ft. of lab space that can be customized for events. The lab is fully equipped for up to 21 surgical stations with monitors and cameras throughout with the option of live feed displayed throughout the facility or streamed over the web.
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