UT Southwestern
Medical Center

Department of Orthopaedic Surgery

UT Southwestern Orthopaedic Journal

2018-2019

From the Editor

The UT Southwestern Department of Orthopaedic Surgery has completed another successful year of academic achievement and excellence. In this, the third annual *UT Southwestern Orthopaedic Journal,* you will find evidence of our Department's rich tradition that has perseverated through the residents and faculty over the decades. The third edition introduces new faculty members and the next crop of residents who will continue to add their individual attributes for the betterment of the Department as a whole. I'd like to thank Brenda Colvin and Julie Mitchell for their help in putting this edition together. Among many other things, they compiled the abstracts for the nearly 200 manuscripts the Department's faculty and residents published in 2018. Without their contributions this *Journal* would not have been possible.

This academic year also marks the completion of the first year of the new Auckland, New Zealand, orthopaedic surgery rotation. It is another example of the truly unique experience of training at our institution. Special thanks to the UT Southwestern Alumni Association and to Drs. Stewart Walsh, Bruce Twaddle, Stuart McCowan, Karl Rathjen, Dickey Jones, and Dane Wukich for their hard work in making the rotation a reality. It was truly a great experience for the current graduating class. The emphasis on family and work-life balance was truly refreshing. The love the Kiwis have for one another is palpable and I believe my family and I are better for experiencing it. I'm excited about the opportunity for the remainder of the residents to experience it as well. I know it will enrich their training experience as it did mine.

As the 2018-2019 academic year comes to a close, it marks the end of the five-year journey my classmates and I began July 1, 2014. I think the six of us have all grown from our experiences here at UT Southwestern, Parkland Memorial Hospital, and Texas Scottish Rite. While the minutes and hours seemed to drag on at times, overall these past five years have gone by quicker than I ever would have imagined. On behalf of the six members of the graduating class, I'd like to thank all those who helped better our experience and education during this time. There are too many names to include here, but our training would not have been as rich without the sacrifice, patience, and dedication of each and every one of you.

At this time I'd like to thank my wife, Gloria, for her love and support over the past five years. Orthopaedic training was difficult at times, but it paled in comparison to keeping myself and our two small children, Stanley and Drew, alive during the rare times you were away. I am 100% positive I would not be half the man I am today without the three of you by my side. For that I am truly thankful.

Please enjoy the *UT Southwestern Orthopaedic Journal* for the 2018-2019 academic year. I think the balance of academics and operative skills will continue to improve and enhance this program. We hope to continue to share these experiences with you in future editions for years to come.

Emmanuel Nwelue, M.D.

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Message From the Chairman

The Department of Orthopaedic Surgery is pleased to publish the third edition of the *UT Southwestern Orthopaedic Journal.* This issue would not have been possible without the hard work of Dr. Emmanuel Nwelue (Editor), Julie Mitchell (Coordinator to the Chair), and Brenda Colvin (Department Administrator).

It is truly an exciting time to be working at UT Southwestern Medical Center. *Newsweek* recently announced that William P. Clements Jr. University Hospital (CUH) is the No.1 hospital in Texas, and *U.S. News & World Report* ranked CUH as the No. 2 hospital in the state. The expansion of CUH continues, with completion expected in September 2020. Currently, the hospital is at 100% capacity on a daily basis. Upon completion of the third tower, CUH will have 751 medical/surgical beds (including ICUs), 59 operating rooms (including cardiac cath labs and hybrid angio suites), and 63 emergency department beds. Because of the increasing number of fractures presenting to CUH, a multidisciplinary fracture service concentrating on “fragility and geriatric fractures” will be starting in the fall of 2019. This program will be in line with the American Orthopaedic Association’s “Own the Bone” program. Coupled with the tremendous facilities and faculty at Parkland Health & Hospital System, the Southwestern Medical District is the fastest-growing academic medical hub in the nation.

UT Southwestern Medical Group ambulatory visits on campus have increased by 47% over the past five fiscal years (2014-18) and grown by 19% at Parkland. As a result, admissions and observations at our University Hospitals have risen by 30% during the same time period. Coinciding with this growth, hospital quality metrics have improved dramatically under the leadership of Drs. Will Daniel and Carol Croft. Vizient, the nation’s leading health care performance improvement company, ranked UTSW as the seventh highest-quality hospital in the U.S. Considering that 95% of academic medical centers are Vizient members, this is a remarkable achievement. UTSW Orthopaedic Surgery benefited from this quality improvement focus, achieving the highest ranking in mortality over the past six months among nationally ranked orthopaedic hospitals. In August 2018, UT Southwestern was nationally ranked in the top 3% of orthopaedic hospitals (49 out of 1,643 hospitals) by *U.S. News & World Report,* and Texas Scottish Rite Hospital was ranked No. 3 in the country for pediatric orthopaedic surgery. Our Orthopaedic Residency Program continues to be ranked as the top program in Texas and in the top five in the southern region. As President John F. Kennedy often stated, “A rising tide lifts all boats,” and Orthopaedic Surgery is benefiting from the tremendous growth and quality of UT Southwestern Medical Center, Parkland Memorial Hospital, and Texas Scottish Rite Hospital.

As the 2018-19 academic year draws to a close, we are fortunate to have Dr. Regis O’Keefe as our Dr. Charles F. Gregory Visiting Professor. Dr. O’Keefe is the Fred C. Reynolds Professor and Chair of the Department of Orthopaedic Surgery at Washington University. He is an internationally renowned orthopaedic clinician-scientist, and, prior to relocating to St. Louis, he was Chair of the Department of Orthopaedic Surgery at the University of Rochester. His leadership experience in orthopaedic surgery is vast, previously serving as President of the American Orthopaedic Association and as Director of the American Board of Orthopaedic Surgery. On a personal note, I have known Regis since my college days when we tried to recruit him to play basketball for Carnegie-Mellon University. He was an outstanding high school basketball player, and Carnegie-Mellon’s loss was Yale’s gain. For full disclosure, Regis and my wife Beverly were high school classmates.

Outstanding new faculty continue to energize the Department of Orthopaedic Surgery. Over the past three years, exceptional individuals have been recruited in adult reconstruction (Drs. Joel Wells, Alex Callan, and Sharon Walton), foot and ankle surgery (Drs. Trapper Lalli and Katherine Raspovic), hand surgery (Drs. Ann Golden and Daniel Koehler), hip preservation (Dr. Wells), oncology (Dr. Callan), sports medicine (Drs. Jay Shah, David Tietze, and Chris McCrum), and spine (Drs. Michael Van Hal and Douglas Dickson). Additional faculty arriving in the fall of 2019 include Dr. Alison Cabrera (shoulder, sports medicine, and general orthopaedics), Dr. Raj Mounasamy (adult reconstruction and oncology), Dr. Shaleen Vira (spine and outcomes research), Dr. Megan Sorich (geriatric trauma and fragility fractures), Dr. Matthew Johnson (foot and ankle), and Dr. Reed Williams (primary care sports medicine). Dr. Lindsay Ramey (primary care sports medicine) will also become fully integrated into the orthopaedic clinic in Las Colinas. UT Southwestern Medical Center at Frisco, a joint project with Texas Health Resources, will be fully operational in late fall of this year. Growth of the clinical faculty is necessary due to expansion in Frisco, Las Colinas, and the VA North Texas Health Care System.

Our research faculty has grown considerably over the past year to complement the work of Paula Hernandez, Ph.D. Many of our research faculty have been recruited in collaboration with the Department of Physical Medicine and Rehabilitation and the School of Health Professions. Yasin Dhaher, Ph.D., a renowned bioengineer, was recruited from Northwestern University and now serves as the Vice Chair of Research. Professor Dhaher has been successfully funded by the NIH (RO1 and UO1), the Department of Defense, and the National Science Foundation. He will be an outstanding mentor to both clinical and research faculty as our research grows. With the assistance of Professor Dhaher, four additional research scientists have been recruited and have either primary or secondary

> “UTSW Orthopaedic Surgery presented in 31 U.S. cities, 16 U.S. states (including Washington, D.C.), and 15 countries on five continents (North America, South America, Asia, Europe, and Australia).”

appointments in orthopaedic surgery. Yen-Sheng “Johnny” Lin, Ph.D., was Professor Dhaher’s postdoctoral fellow in Chicago. His research focuses on biomechanics, medical imaging, and predictive modeling. Yi-Ting Tzen, Ph.D., has experience in evaluating perfusion biomarkers of the skin in vulnerable patients (spinal cord injury and neuropathic patients) and has been the co-investigator on studies funded by the National Institute of Disability and Rehabilitation Research. Metin Yavuz, D.Eng., and his postdoctoral fellow, Ali Ersen, Ph.D., are bioengineers with interests in biomechanics, gait disturbances, and evaluation of shear forces. Dr. Yavuz has also been successful with NIH/NIDDK funding (R15 and Small Business Innovation Research) and industry grants. Given the tremendous opportunity to collaborate with the research resources at Texas Scottish Rite Hospital, the opportunity for UTSW Orthopaedic Research has never been brighter.

The quality of medical students matching UT Southwestern’s Orthopaedic Surgery Residency Program remains exceptionally high. This year, we welcomed six new outstanding orthopaedic interns into our family. This past March, eight extraordinary UT Southwestern students matched at some of the finest programs in the U.S. For the third consecutive year, a UTSW student has matched at Mayo Clinic and another matched at the Harvard Combined Program. These students, as well as our graduating residents, have greatly enhanced the UTSW Orthopaedic Surgery brand.

Faculty and resident scholarly activity continues to demonstrate impressive growth. During calendar year 2018, UTSW Orthopaedic Surgery presented in 31 U.S. cities, 16 U.S. states (including Washington, D.C.), and 15 countries on five continents (North America, South America, Asia, Europe, and Australia). Coupled with the arrival of several dedicated research faculty this past year, the expectations for future research growth is high. It is fortuitous that we’ve expanded our research program over the past several years because our new Dean and Executive Vice President for Academic Affairs has a very strong interest in surgeon-scientists. Prior to being appointed Dean, Dr. W.P. Andrew Lee served as Director of the Department of Plastic Surgery at Johns Hopkins. Before being appointed to that inaugural post, Dr. Lee held leadership positions at UPMC and Harvard. As a surgeon-executive, he demonstrates enthusiasm and passion for outstanding patient care clinician-scientists. His goal is to raise the bar for scholarly activity and grants in all of the surgical specialties at UT Southwestern.

As always, the Department of Orthopaedic Surgery is incredibly fortunate to have Texas Scottish Rite Hospital faculty as our partners. Their outstanding international reputation for patient care and research elevates all of us, and their contribution to education is truly a crown jewel for us. The Department continues to benefit from the encouragement and support of senior UT Southwestern leadership as illustrated by the contributions of Drs. John Warner and Mack Mitchell at our recent retreat. Marcia Schneider, Vice President for Health Strategy and Chief Strategy Officer, was recruited to return to UT Southwestern and is a very strong advocate for our Department. Dr. Rob Bass, Vice Chair of Operations on the University side, facilitated the recent retreat and has assumed a greater leadership role in the Department. His contributions have been immeasurable. The continuing success of UTSW Orthopaedic Surgery is due to our dedicated orthopaedic faculty, committed residents, affiliated institutions, and orthopaedic alumni. Our orthopaedic surgery rotation in Auckland, New Zealand, has been a tremendous success, and we owe a huge debt of gratitude to Dr. Karl Rathjen, Dr. Stewart Walsh, and all alumni for making it a reality.

UT Southwestern Orthopaedics bids farewell and wishes success to our graduating residents as they embark on the next phase of their career. They have represented the Department well and will thrive during their fellowship. All six have assumed leadership positions within the residency program over the past year, and Commencement represents the beginning of a wonderful orthopaedic career. As you advance, it is important to remain open minded to change because change is inevitable in the current health care environment. Remember, only a decade ago, EPIC was defined as a long, heroic poem derived from ancient tradition that was passed on by generations. Who would have thought that EPIC would have taken on a whole new meaning in 2019 and become a part of our daily vernacular?

Thank you for celebrating the accomplishments of UT Southwestern Orthopaedic Surgery. The future is bright as we move “Onward and Upward.”

Sincerely,

Dane K. Wukich, M.D.

Professor and Chair, Department of Orthopaedic Surgery

Holder of the Dr. Charles F. Gregory Distinguished Chair in Orthopaedic Surgery

Orthopaedic Surgery Program

Over the course of five years, the Department of Orthopaedic Surgery at UT Southwestern affords residents a comprehensive combination of patient care, research opportunities, and didactics. This experience extends over multiple hospitals and surgical centers throughout Dallas, many of which have received national recognition for their service to patients and to the field of orthopaedic surgery.

Orthopaedic surgery continues to be one of the most sought-after training programs for graduating U.S. medical students. This year, more than 700 medical students applied to the UT Southwestern Department of Orthopaedic Surgery program, and 80 students formally interviewed on campus for six first-year positions. Applications for fourth-year "subinternships" have also become more competitive. According to Doximity's ranking of residency programs by reputation, UT Southwestern's Orthopaedic Surgery program is the top-ranked program in Texas.

Every Wednesday morning, residents, faculty, ancillary staff, and medical students gather for Chief's Conference. In addition to lectures from orthopaedic faculty and other departments at UTSW, visiting professors from other medical centers around the country offer a diverse, evidenced-based perspective on modern orthopaedics. This is followed by presentations of select surgical cases that reflect our complex patient population and broad spectrum of subspecialty coverage. In addition, a bimonthly M&M conference offers insight into how to avoid and manage the myriad complications that one can encounter while practicing orthopaedic surgery.

Boundless efforts are put forth by faculty and residents alike to provide a year-round curriculum of enriching experiences, including journal clubs, in-training exam reviews, anatomy labs, and surgical skill labs.

UT Southwestern Medical Center

UTSW has two university hospitals: William P. Clements Jr. University Hospital (CUH) – a 12 floor, 460-bed facility opened in 2014 – and Zale Lipshy University Hospital, a 148-bed hospital that has served North Texas since 1989. Elective inpatient surgery is performed at Zale Lipshy. Surgical cases requiring cardiac and/or pulmonary intensive care are performed at CUH. Outpatient cases are performed at the Outpatient Surgery Center (OSC), a modern, efficient surgical center within a mile of both primary hospitals. Residents gain exposure to hip, knee, as well as to shoulder arthroplasty, trauma, hand, spine, foot and ankle, and sports cases at these facilities.

William P. Clements Jr. University Hospital

Parkland Memorial Hospital

Parkland Memorial Hospital
(Parkland Health & Hospital System)

Parkland Memorial Hospital has gone through many phases throughout its service to Dallas County. It began as a wooden structure on Oak Lawn and Maple avenues in 1894. On August 20, 2015, the $1.3 billion, 17-story, 862-bed facility at 5200 Harry Hines Boulevard opened its doors. It remains one of the busiest Level 1 trauma centers in the United States, admitting more than 7,500 trauma patients each year, many of whom have orthopaedic injuries. The clinical volume and pathology at Parkland provide excellent education for residents. In addition to the heavy trauma load they experience, junior and senior residents manage joint reconstruction, hand, spine, sports, and oncology cases.

Texas Scottish Rite Hospital for Children

During their PGY-3 year, orthopaedic residents have the unique opportunity to spend time at the world-renowned Texas Scottish Rite Hospital for Children (TSRH). Over a six-month period (often referred to as a mini-fellowship), residents perform surgical cases and see pathology in clinic that residents at other programs might only read about in textbooks. TSRH has more than 35,000 clinic visits every year – many of which are from international patients who have traveled great distances to see leaders in the field of medicine. The hospital treats children with orthopaedic conditions such as scoliosis, clubfoot, hand disorders, hip disorders, and limb length discrepancies, as well as neurological disorders.

Children's Medical Center Dallas
(Children's Health)

Children's Health is a private, not-for-profit system that is one of the largest pediatric care providers in the United States. Children's Medical Center is its flagship hospital. It was also the first Level 1 pediatric trauma center in Dallas. More than 800,000 patients are seen at Children's and affiliated locations throughout the Metroplex every year. Because of this volume, residents at the PGY-1, -2, and -3 levels become experts at surgical and non-operative treatment of pediatric orthopaedic trauma while rotating here. They are supported by a dedicated team of pediatric orthopaedic surgeons and other health care providers.

Dallas Veterans Affairs Medical Center
(VA North Texas Health Care System)

The VA North Texas Health Care System is the second-largest VA system in the nation. The Dallas VA Medical Center has proudly cared for America's veterans for more than half a century. Residents rotate through the VA as PGY-3, -4, and -5s. The growing population of veterans offers encounters with patients over a wide range of ages. In the same clinic, a resident might indicate an 18-year-old Marine with an ACL rupture and a 90-year-old WWII vet with hip arthritis. Residents are expected to apply knowledge of a variegated spectrum of orthopaedic maladies in the clinic, operating room, and wards.

Ranked #1 hospital in DFW – again

BEST HOSPITALS U.S.News & WORLD REPORT NATIONAL RANKED IN 7 SPECIALTIES 2018-19

UT Southwestern Medical Center's expertise in a wide variety of disciplines is reflected in the annual rankings of America's Best Hospitals from *U.S. News & World Report*.

BEST HOSPITALS U.S.News & WORLD REPORT NATIONAL ORTHOPEDICS 2018-19

In the 2018-19 listings, UT Southwestern was, for the second year in a row, ranked the No. 1 Best Hospital in Dallas-Fort Worth and the No. 2 Best Hospital in Texas, and the orthopaedics program was nationally ranked.

New Zealand Rotation

In 2018, the Department of Orthopaedic Surgery began offering senior residents a three-month orthopaedic surgery rotation in Auckland, New Zealand.

Auckland City Hospital is the major tertiary referral hospital in Auckland, New Zealand, providing services to the population of central Auckland as well as serving as a regional and national referral center for many specialist services. Seventeen orthopaedic surgeons in the Orthopaedic Department provide a comprehensive range of orthopaedic services, and the department is an integral part of the Regional Trauma Service. In association with the Starship Hospital Paediatric Orthopaedic Department on the same campus, there is a commitment to training orthopaedic residents who rotate through the service as part of the New Zealand Orthopaedic Training Program. Fellowship programs are available in trauma, spinal surgery, and arthroplasty. The orthopaedic surgeons at Auckland City Hospital, under the leadership of Dr. Stuart McCowan, have embraced the opportunity to have UT Southwestern residents rotate through the orthopaedic service at the hospital.

Starship Children's Hospital is New Zealand's only tertiary-level children's hospital and, therefore, serves all of New Zealand and many areas of the South Pacific. There are 12 surgeons in the children's orthopaedic department. In addition to a busy acute trauma load, there is also a very high rate of musculoskeletal infections, exposing residents to a broad range of acute orthopaedics. Staff surgeons cover the full range of subspecialty paediatric orthopaedic practice and, in doing so, offer residents the opportunity to be exposed to a wide variety of elective children's orthopaedics. UT Southwestern residents work alongside New Zealand residents and also have the opportunity to collaborate with three fellows, some of whom are international fellows. This adds to the breadth and variety of residents' learning experience at Starship Children's Hospital.

Auckland, New Zealand

Department of Orthopaedic Surgery Faculty and Residents

Department of Orthopaedic Surgery Faculty

Dane K. Wukich, M.D.
Professor and Chairman

Robert L. Bass, M.D.
Associate Professor

Alexandra Callan, M.D.
Assistant Professor

Douglas Dickson, M.D.
Assistant Professor

Maureen A. Finnegan, M.D.
Associate Professor

Kevin Gill, M.D.
Professor

Ann S. Golden, M.D.
Assistant Professor

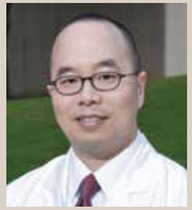
Michael H. Huo, M.D.
Professor

Michael S. Khazzam, M.D.
Associate Professor

Daniel Koehler, M.D.
Assistant Professor

Trapper Lalli, M.D.
Assistant Professor

Yen-Shen Lin, Ph.D.
Assistant Professor



George T. Liu, D.P.M.
Associate Professor

Christopher McCrum, M.D.
Assistant Professor

Katherine Raspovic, D.P.M.
Assistant Professor

Drew T. Sanders, M.D.
Assistant Professor

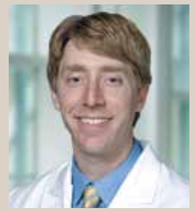
Ashoke K. Sathy, M.D.
Associate Professor

Timothy G. Schacherer, M.D.
Professor

Jay P. Shah, M.D.
Assistant Professor

Adam J. Starr, M.D.
Professor

David C. Tietze, M.D.
Assistant Professor



Michael Van Hal, M.D.
Assistant Professor

Michael D. VanPelt, D.P.M.
Associate Professor

Sharon Walton, M.D.
Assistant Professor

Joel Wells, M.D.
Assistant Professor

Texas Scottish Rite Hospital for Children Faculty

Daniel Sucato, M.D.
Professor and Chief of Staff

John Birch, M.D.
Clinical Professor

Alexander Cherkashin, M.D.
Assistant Professor

Jane Chung, M.D.
Assistant Professor

Lawson Copley, M.D.
Professor

Henry Ellis, M.D.
Assistant Professor

Marybeth Ezaki, M.D.
Clinical Professor

Corey Gill, M.D.
Assistant Professor

John Anthony Herring, M.D.
Professor

Christine Ho, M.D.
Associate Professor

Charles Johnston, M.D.
Professor

Lori Karol, M.D.
Professor

Harry Kim, M.D.
Professor

Amy McIntosh, M.D.
Associate Professor

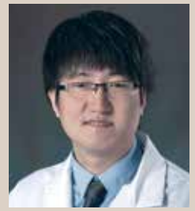
Shane Miller, M.D.
Associate Professor

Scott Oishi, M.D.
Professor

David Podeszwa, M.D.
Associate Professor

Brandon Ramo, M.D.
Assistant Professor

Karl Rathjen, M.D.
Professor



Yinshi Ren, Ph.D.
Assistant Professor

Anthony Riccio, M.D.
Associate Professor

B. Stephens Richards, M.D.
Professor

Mikhail Samchukov, M.D.
Associate Professor

Christopher Stutz, M.D.
Assistant Professor

Philip Wilson, M.D.
Associate Professor

Robert Lane Wimberly, M.D.
Associate Professor

Department of Orthopaedic Surgery Faculty With Secondary Appointments

Carlos Bagley, M.D.
Associate Professor, Neurological Surgery

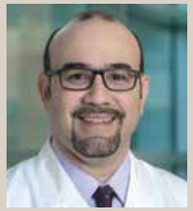
Avneesh Chhabra, M.D.
Associate Professor, Radiology

Beth Deschenes, M.S., D.P.T.
Associate Professor, Physical Therapy

Yasin Dhaher, Ph.D.
Professor, Physical Medicine and Rehabilitation

Nicholas Haddock, M.D.
Associate Professor, Plastic Surgery

Paul Kim, D.P.M.
Professor, Plastic Surgery



Javier LaFontaine, D.P.M.
Professor, Plastic Surgery

Lawrence Lavery, D.P.M.
Professor, Plastic Surgery

Edward Mulligan, D.P.T.
Professor, Physical Therapy

Scott Oishi, M.D.
Professor, Plastic Surgery

Ross Querry, Ph.D.
Professor & Chair, Physical Therapy

Jonathan Rios, Ph.D.
Associate Professor, Eugene McDermott Center for Human Growth and Development

Douglas Sammer, M.D.
Associate Professor, Plastic Surgery

Yi-Ting Tzen, Ph.D.
School of Health Professions

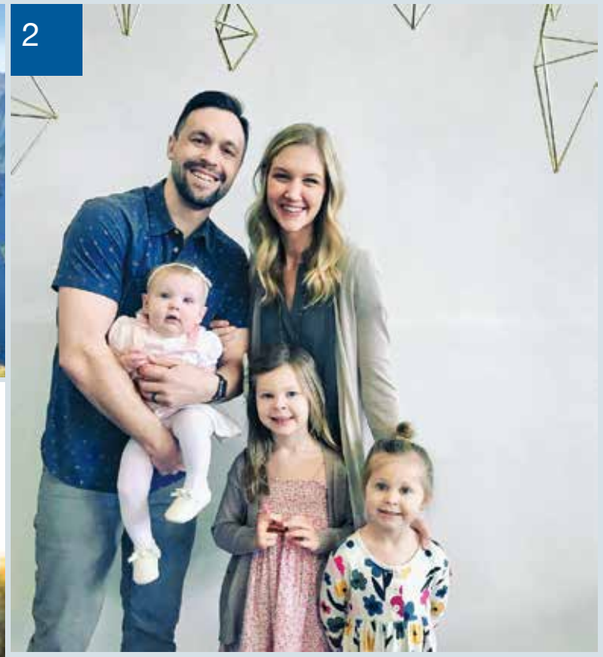
Carol Wise, Ph.D.
Professor, Eugene McDermott Center for Human Growth and Development

Jason Zafereo, M.P.T., Ph.D.
Associate Professor, Physical Therapy

Andrew Zhang, M.D.
Associate Professor, Plastic Surgery

Department of Orthopaedic Surgery Faculty

Department of Orthopaedic Surgery Residents



1. Sean Shahrestani and his wife, Emily. The Shahrestani family will be moving to Houston for his adult reconstruction fellowship at Baylor College of Medicine.
2. Brandon Hull, his wife Lindsay, and daughters Annie, Nora, and Gwen. The Hull family will be moving to Tampa, Florida, for his trauma fellowship at the Florida Orthopaedic Institute.
3. Benjamin Schell, his wife Kaitlyn, and sons Hartwell and Truman. The Schell family will be moving to Seattle for his spine fellowship at the Swedish Medical Center for Adult and Pediatric Spine Surgery.

4. Matthew Landrum, his wife Catherine, and “daughter” Rue. The Landrum family will be moving to Philadelphia for his pediatric fellowship at the Children’s Hospital of Philadelphia.
5. Emmanuel “Manny” Nwelue, his wife Gloria, son Stanley, and daughter Drew. The Nwelue family will be moving to Irvine, California, for his adult reconstruction fellowship at the Hoag Orthopaedic Institute.
6. Paul Tavakolian and his girlfriend, Lindsey. Paul will be moving to Phoenix for his hand fellowship at the University of Arizona Hand, Microsurgery, and Upper Extremity Surgery Program.

Department of Orthopaedic Surgery Incoming Interns

Lauren Bockhor

Hometown: Brenham, Texas

Education: M.D., Texas A&M

B.A., Health Sciences

Personal Interests: Nature, water activities, hiking, running outdoors, scuba diving, spending time with friends and family

Evan Fene

Hometown: McKinney, Texas

Education: M.D., University of Oklahoma

B.S., Microbiology

Personal Interests: Soccer, cooking, health and fitness

Timothy “TJ” Harris

Hometown: Texarkana, Arkansas

Education: M.D., University of Arkansas

B.S., Biology

Personal Interests: Reading, fitness, trivia, hiking, and camping

Nathan Heineman

Hometown: DeSoto, Texas

Education: M.D., UT Southwestern Medical Center

B.A., Economics, University of Oklahoma

Personal Interests: Saltwater aquariums, scuba diving, traveling, running, trying new restaurants, time with family

Austin Serbin

Hometown: Morristown, Tennessee

Education: M.D., Eastern Virginia Medical School

B.A., Microbiology, Miami University, Oxford, OH

Personal Interests: Fitness, mountain biking, piano, guitar, grilling, snowboarding, hiking, baseball, spending time with family and friends

Emily Skarda

Hometown: Minneapolis, Minnesota

Education: M.D., University of Chicago

B.S., Molecular Biology

Personal Interests: Spending time with friends and family, outdoor running, yoga, reading, disposable cameras, plants

Department of Orthopaedic Surgery Research Team

Holders of Endowed Chairs

Robert L. Bass, M.D.
W.B. Carrell Distinguished Professorship of Orthopaedic Surgery

Established in 1946 to support Orthopaedic Surgery.

Dane K. Wukich, M.D.
Dr. Charles F. Gregory Distinguished Chair in Orthopaedic Surgery

Established in 1994 to support Orthopaedic Surgery.

Kevin Gill, M.D.
Aaron A. Hofmann, M.D. and Suzanne Hofmann Distinguished Chair in Orthopaedic Surgery in Honor of Richard E. Jones, M.D.

Established in 1994 to support resident research projects, awards, and education.

Adam J. Starr, M.D.
Hansjoerg Wyss Distinguished Professorship in Orthopaedic Trauma

Established in 2004 to support orthopaedic trauma research, education, and clinical care.

Yasin Dhaher, Ph.D.
R. Wofford Cain Distinguished Chair in Bone and Joint Disease

Established to support research in bone and joint disease.

Charles F. Gregory Memorial Lectureship

The Charles F. Gregory Memorial Lectureship was established to honor Charles F. Gregory, M.D., Chairman of Orthopaedic Surgery at the University of Texas Southwestern Medical School from 1956 to 1976. Dr. Gregory's commitment to postgraduate education led him to formulate objectives for the education of orthopaedic surgeons. These objectives included nurturing of a medical conscience, respect for the heritage of medicine, acquisition of essential information, development of surgical skills, development of respect for the scientific method, and continual pursuit of new advances and refinement of existing skills.

Charles F. Gregory Memorial Lecture Day – June 21, 2019

Keynote Presentation

Regis J. O'Keefe, M.D., Ph.D.

"Periosteum as a Target to Enhance Bone Regeneration" and

"The NIH Patient Reported Outcomes Instrument System as a Standard of Care Tool: The Wash U. Experience"

Graduating Resident Presentation

Emmanuel Nwelue, M.D.

"Outcome of THA in HIV-Positive Patients Managed With Contemporary Protocols"

(Emmanuel Nwelue, M.D.; Clara Telford, B.S.; Kenneth Estrera, M.D.; Richard Jones, M.D.; Michael Huo, M.D.)

Fourth-Year Resident Research Presentations

Michael Del Core, M.D.

"Effect of Diabetes and Hemoglobin A1c on Complications Following Elective Hand Surgery"

(Michael Del Core, M.D.; Timothy Benage, B.S.; Junho Ahn, B.S.; Daniel Koehler, M.D.; Douglas Sammer, M.D.; Ann Golden, M.D.)

Ryan Fairchild, M.D.

"The Utility and Cost of Magnetic Resonance Imaging of the Knee in Elderly Patients: A Retrospective Cohort Study"

(Ryan Fairchild, M.D.; Marcel Wiley, M.D.; Brian Sager, M.D.; Stephen Gates, M.D.; Zachary Shirley, M.D.; Ken Estrera, M.D.; Brigham Au, M.D.)

Stephen Gates, M.D.

"Incidence of Positive Intraoperative Cultures in Primary Shoulder Arthroplasty Following Prior Ipsilateral Shoulder Surgery"

(Stephen Gates, M.D.; Michael Khazzam, M.D.; Michael Del Core, M.D.; Ivy Nguyen; Paul Nakonezny, Ph.D.)

Zachary Shirley, M.D.

"Significant Reduction of Pulmonary Embolism in Orthopaedic Trauma Patients"

(Adam Starr, M.D.; Zachary Shirley, M.D.; Patrick D. Sutphin, M.D., Ph.D.; Drew Sanders, M.D.; Alexander Eastman, M.D.; Brigham Au, M.D.; Ashoke Sathy, M.D.; Gene Hu; Aaron Gebrelul, M.D.; Joseph Minei, M.D.; Michael W. Cripps, M.D.)

S. Blake Wallace, M.D.

"Can Real-Time Monitoring With Dual-Motor Drill Decrease Plunge Depth?"

(Stephen Blake Wallace, M.D.; Mikhail Samchukov, M.D.; Alex Cherkashin, M.D.; Michael Del Core, M.D.; Anthony Riccio, M.D.)

Charles F. Gregory Visiting Professor

Regis J. O'Keefe, M.D., Ph.D.

Fred C. Reynolds Professor and Chair
Department of Orthopaedic Surgery
Washington University School of Medicine

Regis J. O'Keefe, M.D., Ph.D., is the Fred C. Reynolds Professor and Chair of the Department of Orthopaedic Surgery at Washington University School of Medicine in St. Louis. Dr. O'Keefe earned his B.A. in philosophy and religious studies and graduated magna cum laude at Yale University in New Haven, Connecticut. After earning his medical degree from Harvard Medical School in Boston, he completed a Ph.D. in biochemistry and biophysics at the University of Rochester School of Medicine and Dentistry. Dr. O'Keefe served his internship in surgery at New England Deaconess Hospital in Boston, his residency in orthopaedics at the University of Rochester Medical Center, and completed an oncology fellowship at Massachusetts General Hospital. In 1993 he joined the faculty at the University of Rochester. Dr. O'Keefe previously served as the Marjorie Strong Wehle Professor and Chair of the Department of Orthopaedics and Rehabilitation and Associate Dean of Clinical Affairs at the University of Rochester School of Medicine and Dentistry.

Dr. O'Keefe has authored or co-authored over 290 articles, more than 300 abstracts, 16 book chapters, and numerous reviews concerning bone repair and development, cancer, inflammatory diseases of bone, genetics, and related topics. Most of his research has been supported by National Institutes of Health (NIH) grants, and his NIH funding has consistently placed him among the most highly funded orthopaedic surgeon-clinician scientists in the United States. In 2012 Dr. O'Keefe received a five-year Center of Research Translation program grant from the NIH. This award provides $7.5 million to study factors regulating stem cell populations during bone and cartilage repair.

He has served as an Associate Editor of the *Journal of Bone and Mineral Research* and is currently an Associate Editor of *Bone.* Dr. O'Keefe has been in numerous leadership roles in national orthopaedic organizations, including President of the American Orthopaedic Association in 2017-18. For 10 years he was on the Board of Directors of the American Board of Orthopaedic Surgery. In addition, he served for more than seven years as a member of the Orthopaedic Research and Education Foundation, including service as Secretary of that organization. Dr. O'Keefe is a past-President of the Orthopaedic Research Society (ORS). He also served the ORS as Treasurer and as a member of the Program Committee. He is the past-President of the United States Bone and Joint Decade, an international coalition of health care organizations that aims to decrease the incidence of bone and joint disorders. Dr. O'Keefe is also the past-Chair of the Skeletal Biology and Skeletal Regeneration Study Section for the NIH's Center for Scientific Review and he has served on the advisory councils of the NIH's National Institute of Arthritis and Musculoskeletal and Skin Diseases, as well as the NIH's Council of Councils that reviews trans-NIH initiatives. Dr. O'Keefe has been Chair of the American Academy of Orthopaedic Surgeons' Clinician Scientist Committee. He also has directed the Orthopaedic Research and Education Foundation's Grant Writing Workshop, a program that mentors young scientists in the critical skill of grant writing. He is a member of the American Association of Physicians.

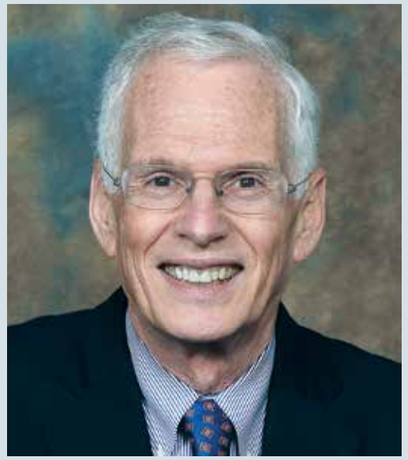
Dr. O'Keefe has received a variety of teaching and scientific awards, including the prestigious ABC Traveling Fellowship from the American Orthopaedic Association and the Kappa Delta Award recognizing excellence in orthopaedic research. He has worked diligently in his career to promote and advance basic understanding of musculoskeletal diseases and to translate these discoveries into therapies to improve the care of orthopaedic patients.

Inaugural W.B. Carrell Visiting Professorship

Dr. Peter Stern is a modern-day giant in the fields of orthopaedic surgery and hand surgery. He is currently the Norman S. and Elizabeth C.A. Hill Professor in Orthopaedic Surgery at the University of Cincinnati College of Medicine. It was there that he was Chair of Orthopaedic Surgery for 21 years, overseeing the training of more than 120 residents in the specialty. He is also the Director of one of the most sought-after hand surgery fellowships in the nation, the Mary S. Stern Fellowship in Hand Surgery. This fellowship has been active since 1989, and Dr. Stern and his associates have trained 68 fellows, 14 of whom are now in full- or part-time academic medicine.
Dr. Stern has served as President of the American Society for Surgery of the Hand, President of the American Board of Orthopaedic Surgery, and President of the American Orthopaedic Association and held numerous other leadership positions, inspiring a generation of young surgeons.

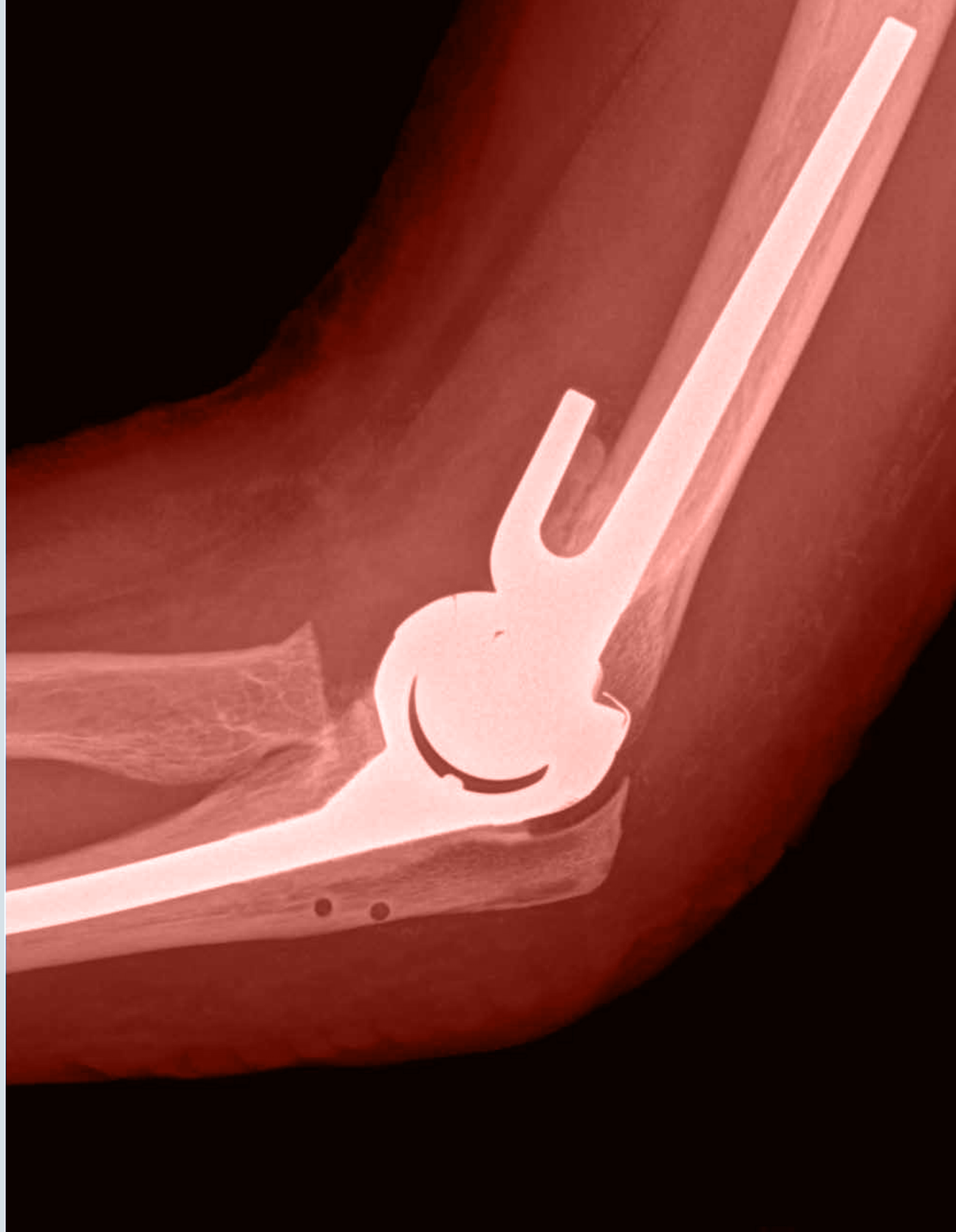
During his inaugural W.B. Carrell Visiting Professorship, UT Southwestern residents and faculty had the privilege and honor to listen to Dr. Stern discuss excellence in hand surgery and psychiatric disorders of the upper extremity. Dr. Stern also participated in a panel discussion about health care costs and the future of medicine in this area of the specialty with several other senior faculty members and visiting distinguished visitors.

Dr. Stern was the first of many acclaimed academic orthopaedic surgeons who will come to UT Southwestern and share their expertise in a lectureship honoring W.B. Carrell, M.D., a renowned surgeon, teacher, and mentor when othopaedics was in its infancy.



Peter Stern, M.D.

Norman S. and Elizabeth C.A. Hill Professor in Orthopaedic Surgery, Division of Hand Surgery, University of Cincinnati College of Medicine



1. Night float breakfast with Dr. Reinert
2. Senior class intern year
3. PGY-1 class in call room
4. Senior class end of second year with Dr. Starr

5. Dallas Marathon
6. Resident Christmas party
7. PGY-3 class at graduation
8. Department of Orthopaedic Surgery Christmas party

Aaron A. Hofmann, M.D., and Suzanne Hofmann Distinguished Chair in Orthopaedic Surgery Graduating Resident Awards

Dr. Aaron A. Hofmann established the following awards for graduating residents to honor three orthopaedic surgeons who significantly influenced him during his orthopaedic residency at UT Southwestern.

The Awards

W. Brandon Carrell Distinguished Physician Award

Presented to the current PGY-5 resident who throughout his or her residency consistently displayed empathy, concern, and compassion for his or her patients, colleagues, and staff.

The W. Brandon Carrell Award winner is determined by current full-time faculty.

G. Truett James Award for Excellence in Teaching

Presented to the current PGY-5 resident who was most dedicated to teaching others.

This award is determined by residents.

Vert Mooney Award for Academic Achievement

Presented to the current PGY-5 who has performed at a high academic level during his or her residency.

This award is determined by the resident's overall academic achievement during residency, i.e., research, posters, and presentations.

2018 Annual Resident Awards

Brandon Carrell Award – **Craig Birch, M.D.**

Vert Mooney Award – **Marcel Wiley, M.D.**

G. Truett James Award – **Brian Sager, M.D.**

Past Hofmann Resident Award Recipients

2017
Brandon Carrell Award – Jessica Wingfield, M.D.
G. Truett James Award – Matthew Swann, M.D.
Vert Mooney Award – Matthew Swann, M.D.

2016
Brandon Carrell Award – Sheena Black, M.D.
G. Truett James Award – Ryan Rose, M.D.
Vert Mooney Award – Timothy Brown, M.D.

2015
Brandon Carrell Award – Kelly Cline, M.D.
G. Truett James Award – Kelly Cline, M.D.
Vert Mooney Award – Robert Russell, M.D.

2014
Brandon Carrell Award – Gant Hogue, M.D.
G. Truett James Award – Drew Sanders, M.D.
Vert Mooney Award – Kenneth Estrera, M.D.

2013
Brandon Carrell Award – Guilluame Dumont, M.D.
G. Truett James Award – Paul Chin, M.D.
Vert Mooney Award – Justin Knight, M.D.

2012
Brandon Carrell Award – Jacob Zide, M.D.
G. Truett James Award – Charles Osier Jr., M.D.
Vert Mooney Award – Chris Espinoza-Ervin, M.D.

2011
Brandon Carrell Award – James R. Phelps, M.D.
G. Truett James Award – Joshua Fox, M.D.
Vert Mooney Award – No recipient

2010
Brandon Carrell Award – Henry Ellis, M.D.
G. Truett James Award – Hilton Gottschalk, M.D.
Vert Mooney Award – Henry Ellis, M.D.

2009
Brandon Carrell Award – Daniel Chan, M.D.
G. Truett James Award – Chad Hanson, M.D.
Vert Mooney Award – Megan Swanson, M.D.

Harold A. "Pete" Mattson Award for Outstanding Leadership

This award is given annually to a physician who demonstrates outstanding personal, moral, and professional leadership for our residents. The award is named in honor of a man who embodied all of these virtues.

2018 Mattson Award Recipient

Karl Rathjen, M.D.

Past Mattson Award Recipients

2017 – *Drew T. Sanders, M.D.*
2016 – *Adam J. Starr, M.D.*
2015 – *Robert W. Bucholz, M.D.*
2014 – *Michael H. Huo, M.D.*
2013 – *Adam J. Starr, M.D.*

Charles M. Reinert Award

This award is presented annually to a physician for going above and beyond the call of duty … for selfless dedication to resident education … for being a pillar of consistency amidst a sea of change … for always being available for assistance … for being a role model in the truest sense of the word … for teaching us to do the right thing.

2018 Reinert Award Recipient

Brigham Au, M.D.

Past Reinert Award Recipients

2017 – *Adam J. Starr, M.D.*
2016 – *Timothy G. Schacherer, M.D.*
2015 – *Timothy G. Schacherer, M.D.*
2014 – *Adam J. Starr, M.D.*
2013 – *William "Bill" Robertson, M.D.*
2012 – *Michael H. Huo, M.D.*
2011 – *Michael H. Huo, M.D.*
2010 – *James B. "Monty" Montgomery, M.D.*

Robert W. Bucholz Award

This newly created award is presented by the graduating class to a faculty member who is an exceptional surgeon, dedicated educator, leader, mentor, and caring friend who embodies these virtues both as a physician and as a person.

2018 Bucholz Award Recipient

Adam J. Starr, M.D.

Renal Function as a Predictor of Early Transmetatarsal Amputation Failure

Foot Ankle Spec. 2018 Dec 12:1938640018816371. doi: 10.1177/1938640018816371. [Epub ahead of print]
Ahn J, **Raspovic KM, Liu GT, Lavery LA, La Fontaine J,** Nakonezny PA, **Wukich DK**

Abstract: Chronic kidney disease (CKD) is a major concern in patients with foot disease because it is associated with high rates of neuropathy, peripheral vascular disease, and poor wound healing. The purpose of this study was to evaluate renal dysfunction as a risk factor for reamputation after initial transmetatarsal amputation (TMA). Patients who underwent a TMA were retrospectively identified in the American College of Surgeons National Surgical Quality Improvement Program database. Of 2018 patients, reamputation after TMA occurred in 4.4%. End-stage renal disease (ESRD) was associated with 100% increased odds of TMA failure (adjusted odds ratio [OR] = 2.00; 95% CI = 1.10, 3.52), 128% increased odds of major amputation (adjusted OR = 2.28; 95% CI = 1.27, 3.96), and 182% increased odds of 30-day mortality (adjusted OR = 2.82; 95% CI = 1.69, 4.64). In addition, white blood cell count > 10,000/mm^3 and deep infection at the time of surgery were independently associated with TMA failure. In conclusion, severe renal dysfunction is associated with TMA failure in the short-term, perioperative period. There was no incremental increase in risk of TMA failure with worsening level of renal function before ESRD. A multidisciplinary approach should be implemented in patients with CKD to prevent foot-related pathologies that may necessitate lower-extremity amputation.

A Comparison of Transphyseal Neck-Head Tunneling and Multiple Epiphyseal Drilling on Femoral Head Healing Following Ischemic Osteonecrosis: An Experimental Investigation in Immature Pigs

J Pediatr Orthop. 2018 Jul 2. doi: 10.1097/BPO.0000000000001219. [Epub ahead of print]
Aruwajoye OO, Monte F, Kim A, **Kim HKW**

Background: Two operative procedures are currently advocated to stimulate the necrotic femoral head healing in children with Legg-Calvé-Perthes disease: transphyseal neck-head tunneling (TNHT) and multiple epiphyseal drilling (MED). The purpose of this study was to compare the bone healing and physeal function after treatment with TNHT or MED in a piglet model of ischemic osteonecrosis.

Methods: Eighteen piglets were induced with osteonecrosis by surgically placing a ligature tightly around the right femoral neck. One week later, the piglets were assigned to 1 of 3 treatment groups (n = 6/group): (1) local nonweight bearing only (NWB), (2) TNHT plus NWB, or (3) MED plus NWB. The unoperated left femoral heads were used as normal controls. The animals were euthanized at 8 weeks after osteonecrosis induction. Histologic, histomorphometric, radiographic, microcomputed tomography (CT), and calcein-labeling assessments were performed. Statistical analysis included a 1-way ANOVA.

Results: Micro-CT analyses showed higher femoral head bone volume in the MED group compared with the TNHT and the NWB groups (P < 0.01). The MED group had a higher mean trabecular number (P < 0.001) and new bone formation (P = 0.001) based on calcein-labeling parameters compared with the TNHT and the NWB groups. In addition, the osteoclast number per bone surface was lower in the MED group compared with the NWB group (P = 0.001). Histologic and micro-CT assessments of the proximal femoral physis revealed a larger physeal disruption at the site of physeal drilling in the TNHT group compared with the MED group. However, no significant differences in physeal elongation (P = 0.61) and femoral neck length (P = 0.31) were observed between the treatment groups.

Conclusions: MED produced a higher bone volume and stimulated greater bone formation than the TNHT or the NWB alone. Both procedures did not produce a significant physeal growth disturbance during the study period.

Clinical Relevance: This preclinical study provides evidence that MED produces more favorable bone healing than the TNHT in a large animal model of Legg-Calvé-Perthes disease.

Time-Driven Activity-Based Costing: Lessons From an Application in Health Care

Accounting Horizons. 2018; 32(4):31-47.
Balakrishnan R, **Koehler DM,** Shah AS

Abstract: We estimate the costs of two substitutable medical procedures in a hospital as reported by a conventional two-stage system and from using TDABC concepts. Comparisons yield insights into the data needs for both systems, and practical issues that arise when implementing TDABC in an organization with a complex cost structure. As “lessons learned,” we list four insights relating to simplifying the data needs of a TDABC system. We also discuss how features of the traditional system influence the differences in the cost estimates from the two approaches. Based on our experience, we offer suggestions on how organizations might be able reap many of the benefits associated with TDABC without an overhaul of the entire costing system.

Arthroscopic Ganglionectomy in the Pediatric Population

Plast Reconstr Surg. 2018 Nov;142(5):718e-721e. doi: 10.1097/PRS.0000000000004844.
Ben-Amotz O, Pezeshk RA, **Sammer DM,** Cheng J

Background: Arthroscopic dorsal wrist ganglionectomy is an established alternative to open excision in the adult population. The purpose of this study was to retrospectively compare outcomes of arthroscopic and open dorsal wrist ganglionectomy in the pediatric population.

Methods: All patients who underwent arthroscopic or open dorsal wrist ganglionectomy at a single pediatric institution between 2011 and 2014 were retrospectively evaluated by chart review and telephone interview. The primary outcome variable was whether or not the cyst had recurred. Other outcome measures included the incidence of complications and patient-rated outcome measures such as satisfaction, pain, function, and aesthetics.

Results: There were eight cases of arthroscopic and 19 cases of open ganglionectomy, with a mean age of 14 years. At an average follow-up of 2 years, the recurrence rate was one of eight for the arthroscopic group and two of 19 for the open group. No patients in the arthroscopic group reported functional limitations, compared with three patients in the open group. On a 10-point scar appearance scale, with 1 being not satisfied at all and 10 being highly satisfied, the median score in the arthroscopic group was 9.5, compared with 8 in the open group. No patients in the arthroscopic group had residual pain at the surgical site, compared with nine patients in the open group, a finding that was statistically significant. All patients in the arthroscopic group reported that they would undergo surgery again, whereas two patients in the open group would not undergo surgery again.

Conclusion: Arthroscopic dorsal wrist ganglionectomy compares favorably with open ganglionectomy in the pediatric population.

Biomechanical Analysis of Retrograde Flexible Intramedullary Nail Constructs in a Simulated Pediatric Femur Fracture Model

J Pediatr Orthop. 2019 Jan;39(1):22-27. doi: 10.1097/BPO.0000000000000946.
Bland DC, Black SR, Pierce WA, **Wimberly RL, Riccio AI**

Background: Various flexible intramedullary nail (FIMN) constructs for pediatric femur fractures are described; however, no biomechanical study has compared stability of medial-lateral entry versus all-lateral entry retrograde nailing. Our purpose is to compare the rotational and bending stiffness of 2 different FIMN constructs and 2 different materials in a simulated pediatric femur fracture model.

Methods: Eighty adolescent-sized composite femurs were used to simulate transverse (40 femurs) and oblique (40 femurs) mid-diaphyseal fractures. Retrograde FIMN of the femurs was performed using either 3.5 mm titanium (Ti) or 3.5 mm stainless-steel (SS) flexible nails in 2 configurations: 2 "C"-shaped nails (CC) placed through medial and lateral entry sites or 1 "C"-shaped nail and 1 "S"-shaped nail (CS) placed through a single lateral entry site. Models were first tested in 10 cycles of axial rotation to ±1 N m of torque at a rate of 0.5 degrees/s under 36 kg of compression. Axial compression was performed and bending stiffness defined as the force required to achieve 10 degrees varus at the fracture site.

Results: No differences were noted in rotational stiffness comparing Ti and SS nails regardless of nail configuration or fracture pattern. Comparable rotational stability was found for CC and CS configurations with SS implants for both fracture patterns. The CS construct (0.60 N m/degree) was stiffer in rotation than the CC construct (0.41 N m/degree) with Ti implants in the transverse fracture model ($P < 0.005$). SS nails provided greater bending stiffness than Ti nails in both oblique and transverse fracture patterns, regardless of nail construct. The all-lateral entry (CS) construct demonstrated statistically significant greater bending stiffness regardless of implant material or fracture pattern ($P < 0.03$).

Conclusions: An all-lateral entry (CS) FIMN construct demonstrated greater bending stiffness in both fracture patterns and materials. Ti and SS implants have comparable rotational stiffness in all fracture patterns and materials; however, SS nails were superior at resisting bending forces in both fracture patterns. CS nail configuration and SS implants demonstrated superior bending stiffness and rotational stiffness when compared with the more commonly used CC construct and Ti implants.

Tranexamic Acid Administration for Anatomic and Reverse Total Shoulder Arthroplasty: A Systematic Review and Meta-Analysis

JSES Open Access. 2018 Feb 15;2(1):28-33. doi: 10.1016/j.jses.2017.12.004. eCollection 2018 Mar.
Box HN, Tisano BS, **Khazzam M**

Background: Tranexamic acid (TXA) has been shown to reduce perioperative blood loss and risk of blood transfusion. Evidence establishing its efficacy in total shoulder arthroplasty (TSA) is limited. The current study evaluated the effect of TXA on perioperative blood loss and transfusion risk after TSA.

Methods: A systematic review and meta-analysis of TXA administration for TSA was performed, and 6 studies with a total of 680 patients were found. Data on change in hemoglobin, drain output, total blood loss, and transfusion were extracted. Meta-analysis was performed with stratification into reverse and anatomic TSA subgroups.

Results: TXA administration was associated with decreased change in hemoglobin (-0.63 g/dL; 95% CI, -0.87 to -0.39 g/dL; $P < .00001$), drain output (-112.05 mL; 95% CI, -182.29 to -41.81 mL; $P < .0001$), and total blood loss (-231.87 mL; 95% CI, -334.23 to -129.48 mL; $P < .00001$) after reverse TSA. There was a trend toward reduction in transfusion rate after reverse TSA (-4%; 95% CI, -8% to 0%; $P = .06$). TXA administration was associated with reduced drain output after anatomic TSA (-123.07 mL; 95% CI, -163.93 to -82.20 mL; $P < 0.00001$). TXA administration was not associated with decreased transfusion rate after anatomic TSA. Data to evaluate the effect of TXA on change in hemoglobin and total blood loss after anatomic TSA were insufficient.

Conclusions: Routine administration of TXA reduces perioperative blood loss and may reduce the risk of transfusion after reverse TSA. Future studies are needed to further characterize its effect on the risk of transfusion after reverse TSA and efficacy in anatomic TSA.

Plantar Fibromatosis: Pathophysiology, Surgical and Nonsurgical Therapies: An Evidence-Based Review

Foot Ankle Spec. 2018 Apr;11(2):168-176. doi: 10.1177/1938640017751184. Epub 2018 Jan 9. Review.
Carroll P, Henshaw RM, Garwood C, **Raspovic K,** Kumar D

Abstract: Plantar fibromatosis (morbus Ledderhose), an extra-abdominal desmoid tumor of the plantar foot, is a rare benign hyperproliferative disorder of the plantar fascia with an unknown etiology. The main clinical characteristics include slow-growing nodules on the medial and central bands of the plantar fascia, which may become painful and negatively affect ambulation. Most established conservative therapies today target symptomatic relief. As symptoms progress, therapies such as injections, shockwave ablation, radiation, and/or surgery may be required. This review aims to provide insight into the pathophysiology of this condition in addition to detailing current and investigational therapies for this disorder. Many therapies have been proven in similar conditions, which could lead to promising treatment options for plantar fibromatosis.

Treatment Strategies and Frame Configurations in the Management of Foot and Ankle Deformities

Clin Podiatr Med Surg. 2018 Oct;35(4):423-442. doi: 10.1016/j.cpm.2018.05.003. Epub 2018 Aug 11.
Cherkashin AM, Samchukov ML, Birkholts F

Abstract: To provide standardized nomenclature for various hexapod frame configurations for foot and ankle deformity correction, a unique classification of the hexapod external fixators was proposed. This classification is based on number of correction levels, secured anatomic blocks, and direction of the strut attachment. It allows the combination of all different foot and ankle frame assemblies into a few standard hexapod configurations, irrespective of which external fixator is used.

Conventional MR and Diffusion-Weighted Imaging of Musculoskeletal Soft Tissue Malignancy: Correlation With Histologic Grading

Eur Radiol. 2018 Dec 3. doi: 10.1007/s00330-018-5845-9.
Chhabra A, Ashikyan O, Slepicka C, Dettori N, Hwang H, **Callan A,** Sharma RR, Xi Y

Aim: To evaluate proven soft tissue musculoskeletal malignancies blinded to their Fédération Nationale des Centres de Lutte Contre le Cancer histologic grades to identify the predictive values of conventional MR findings and best fit region of interest (ROI) apparent diffusion coefficient (ADC) measurements.

Materials and Methods: Fifty-one consecutive patients with different histologic grades were evaluated by four readers (R1-4) of different experience levels. Quantitatively, the maximum longitudinal size, tumor-to-muscle signal intensity ratios, and ADC measurements and, qualitatively, the spatial location of the tumor, its signal alterations, heterogeneity, intralesional hemorrhage or fat, and types of enhancement were assessed. Intraclass correlation, weighted kappa, ANOVA, and Fisher exact tests were used.

Results: There were 22/51 (43%) men (mean age ± SD = 52 ± 16 years) and 29/51 (57%) women (mean age ± SD = 54 ± 17 years), with the majority of tumors 38/51 (75%) in the lower extremities. Histologic grades were I in 8/51 (16%), II in 17/51 (33%), and III in 26/51 (51%), respectively. The longitudinal dimensions were different among three grades ($p = 0.0015$), largest with grade I. More central enhancements and deep locations were seen in grade III tumors ($p = 0.0191$, 0.0246). The ADC mean

was significantly lower in grade III than in grade I or II ($p < 0.0001$ and $p = 0.04$). The ADC min was significantly lower in grade III than in grade I ($p = 0.02$). Good to excellent agreements were seen for T1/T2 tumor/muscle ratios, longitudinal dimension, and ADC (ICC = 0.60-0.98).

Conclusion: Longitudinal tumor dimension, central enhancement, and ADC values differentiate histology grades in musculoskeletal soft tissue malignancy with good to excellent inter-reader reliability.

Posterior Vertebral Endplate Fractures: A Retrospective Study on a Rare Etiology of Back Pain in Youth and Young Adults

PM&R. 2019 Mar 7. doi: 10.1016/j.pmrj.2018.10.002. [Epub ahead of print]
Conlee EM, Driscoll SW, Coleman Wood KA, **McIntosh AL,** Dekutoski ML, Brandenburg JE

Background: Posterior lumbar vertebral endplate fracture occurs with avulsion of the ring apophysis from the posterior vertebral body. Although this has been described in adolescents and young adults, proper diagnosis is often delayed or missed entirely. Surgery may be curative.

Objective: To determine the common clinical features and treatment outcomes in youth and young adults with posterior lumbar vertebral endplate fractures.

Design: Retrospective case series.

Setting: Academic medical institution.

Patients: Patients 10 to 25 years old from 2000 through 2012 with posterior vertebral endplate fracture diagnosis.

Main Outcome Measurements: Demographic characteristics, diagnostic studies, interventions, and change in symptoms postoperatively.

Results: A total of 16 patients had posterior vertebral endplate fractures (8 male patients; mean age, 15.2 years) – 8.3% of 192 patients with inclusion age range undergoing spinal surgery for causes unrelated to trauma, scoliosis, or malignancy. The most common signs and symptoms were low back and radiating leg pain, positive straight leg raise, hamstring contracture, and abnormal gait. Cause was sports related for 12 patients (75%). Mean (range) time to diagnosis was 13.0 (3.0-63.0) months. Diagnosis was most commonly made with lumbar magnetic resonance imaging (n = 6). Most fractures occurred at L5 (n = 8, 50%) and L4 (n = 5, 31.3%). Conservative measures were trialed before surgery. Nine patients had “complete relief” following surgery and seven “improved.”

Conclusions: Posterior vertebral endplate fracture should be considered in differential diagnosis of a youth or young adult with back pain, radiating leg pain, and limited knee extension, regardless of symptom onset. For patients in whom conservative management fails, consultation with an experienced physician whose practice specializes in spine medicine is recommended.

Biomechanical Evaluation of Location and Mode of Failure in Three Screw Fixations for a Comminuted Transforaminal Sacral Fracture Model

J Orthop Translat. 2018 Jul 10;16:102-111. doi: 10.1016/j.jot.2018.06.005. eCollection 2019 Jan.
Crist BD, Pfeiffer FM, **Khazzam MS,** Kueny RA, Della Rocca GJ, Carson WL

Background: Pelvic ring-comminuted transforaminal sacral fracture injuries are rotationally and vertically unstable and have a high rate of failure.

Objective: Our study purpose was to use three-dimensional (3D) optical tracking to detect onset location of bone-implant interface failure and measure the distances and angles between screws and line of applied force for correlation to strength of pelvic fracture fixation techniques.

Methods: 3D relative motion across sacral-rami fractures and screws relative to bone was measured with an optical tracking system. Synthetic pelves were used. Comminuted transforaminal sacral-rami fractures were modeled. Each pelvis was stabilized by (1) two iliosacral screws in S1, (2) one transsacral screw in S1 and one iliosacral screw in S1, or (3) one trans-alar screw in S1 and one iliosacral screw in S1; three more fixation groups (4-6) consisted of the addition of an anterior inferior iliac pelvic external fixator. Eighteen instrumented pelvic models with right ilium fixed simulate single-leg stance. Load was applied to center of S1 superior endplate. Five cycles of torque were initially applied, sequentially increased until permanent deformation occurred. Five cycles of axial load compression were next applied, sequentially increased until permanent deformation occurred, followed by axial loading to catastrophic failure. A Student t test was used to determine significance ($p < 0.05$).

Results: The model, protocol, and 3D optical system have the ability to locate how sub-catastrophic failures initiate. Our results indicate failure of all screw-based constructs is due to localized bone failure (screw pull-in push-out at the ipsilateral ilium-screw interface, not in sacrum); thus, no difference was observed when not supplemented with external fixation.

Conclusion: Inclusion of external fixation improved resistance only to torsional loading.

Translational Potential of This Article: Patients with comminuted transforaminal sacral-ipsilateral rami fractures benefit from this fixation.

Hallux Valgus and Metatarsus Adductus Measurements: Inter-Reader Reliability and Correlations on Radiographs and MRI

Clin Radiol. 2018 Dec;73(12):1057.e7-1057.e11. doi: 10.1016/j.crad.2018.08.004. Epub 2018 Sep 11.
Dessouky R, Heineman N, Zhang L, Hummel J, Skweres J, **Wukich D, Chhabra A**

Aim: To assess inter-reader reliability of metatarsus adductus (MA) using the traditional method and Engel’s angle (EA) on radiography and magnetic resonance imaging (MRI) and assess correlations with hallux valgus (HV).

Methods and Materials: Ninety consecutive patients with radiographs and MRI of the foot were included. Two readers measured HV angle (HVA), traditional metatarsus adductus angle (MAA), and EA on radiographs and HVA and EA on MRI. Three- and two-way mixed model analyses were used for reader agreements. Ninety-five percent bootstrap confidence intervals were calculated. The linear mixed model was used for association between HVA and EA/MAA.

Results: Mean age and male to female ratio was 54.2 ± 15.4 and 0.4:1, respectively. Mean HVA and EA were 20.6 ± 9.4 and 21.2 ± 8, 21.2 ± 8.3, and 22.4 ± 7.5 on radiographs and MRI, respectively. Mean MAA was 18.5 ± 5.7 on radiographs. Inter-reader agreement was good for EA (ICC = 0.73, 0.6) and moderate for MAA (ICC = 0.41). Positive correlations between HVA, MAA, and EA on radiographs and MRI were found, but none were statistically significant ($p = 0.44$ and 0.87).

Conclusions: Engel’s angle is more reproducible. Although positive correlations exist between the degrees of HV and MA, they are not statistically significant.

Magnetic Resonance Neurography of the Lumbosacral Plexus in Failed Back Surgery Syndrome

Spine (Phila Pa 1976). 2018 Jun 15;43(12):839-847. doi: 10.1097/BRS.0000000000002460.
Dessouky R, **Khaleel M,** Khalifa DN, Tantawy HI, **Chhabra A**

Objective: To study the role of magnetic resonance neurography (MRN) of the lumbosacral plexus in management of patients with failed back surgery syndrome (FBSS).

Summary of Background Data: FBSS is one of the major problems in health care, affecting up to 40% of patients after spine surgery. To date, no imaging modality has been used to effectively classify nerve compression because nerve injuries are challenging to detect on conventional lumbar spine magnetic resonance imaging (MRI). To our knowledge, no previous studies have addressed the use of MRN in FBSS or compared it to lumbar spine MRI.

Methods: From 203 consecutive 3 T MRN studies of lumbosacral plexus in 1 year, 12% (25/203) presented as FBSS. Demographic data, number of previous lumbar MRIs and their findings, MRN findings, interval between MRI and MRN, pre- and post-MRN diagnosis, pain levels, and treatments were recorded. Changes in diagnosis, treatment, and outcomes after MRN were determined.

Results: The final sample of 25 patients had a mean age 62 ± 15 and male to female ratio 1:1.08. Approximately 88% (22/25) had previous lumbar MRI, of which 27% had 3 or more. Most common imaging findings were neuroforaminal stenosis 22.6% (7/31) on MRI and neuropathy 22.9% (19/83) on MRN. Mean interval between MRI and MRN was 13.9 ± 28.3 months. Lumbar MRIs were inconclusive in 36% (8/22). MRN detected 63% (52/83) more findings and changed the diagnosis and treatment in 12% and 48% of FBSS cases, respectively. Favorable outcomes were recorded in 40% to 67% of patients following MRN-guided treatments.

Conclusion: FBSS is a complex problem, and MRN of lumbosacral plexus impacts its management by better directing source of symptoms.

Magnetic Resonance Neurography in Chronic Lumbosacral and Pelvic Pain: Diagnostic and Management Impact-Institutional Audit

World Neurosurg. 2018 Jun;114:e77-e113. doi: 10.1016/j.wneu.2018.02.072. Epub 2018 Mar 23.
Dessouky R, Xi Y, Scott KM, **Khaleel M, Gill K,** Jones S, Khalifa DN, Tantawy HI, Aidaros MA, **Chhabra A**

Background/Objective: Low back and pelvic pain are among the most prevalent conditions worldwide, with major social and economic costs. The aim of this study was to evaluate the role of magnetic resonance neurography (MRN) of lumbosacral plexus in the management and outcomes of these patients with chronic pain.

Methods: Consecutive patients with chronic lumbosacral and pelvic pain referred for MRN over a year were included. Preimaging and postimaging clinical diagnosis and treatment, pain levels, and location were recorded. Pain-free survival was compared between treatments using a Cox proportional hazards model.

Results: A total of 202 patients with mean age 53.7 ± 14.8 years and a male/female ratio of 1:1.53 were included. Of these patients, 115 presented with radiculopathy (57%), 56 with pelvic pain (28%), and 31 with groin pain (15%). Mean initial pain level was 6.9 ± 1.9. Mean symptom duration was 4.21 ± 5.86 years. Of these patients, 143 (71%) had a change in management because of MRN. After MRN, reduction in pain levels was observed in 21 of 32 patients receiving conservative treatment (66%), 42 of 67 receiving injections (63%), and 27 of 33 receiving surgery (82%). Follow-ups were available in 131 patients. Median pain-free survival was 12 months. Patients treated with surgery had significantly lower pain recurrence than patients receiving other treatments in the same time frame (hazard ratio, 3.6; 95% confidence interval, 1.4-9.2; P = 0.0061).

Conclusions: MRN use in chronic lumbosacral and pelvic pain led to a meaningful change in diagnosis and treatment. After MRN, conservative treatment and injections provided pain relief; however, patients benefited more from surgery than from any other treatment.

Improvement in Scoliosis Research Society-22R Pain Scores After Surgery for Adolescent Idiopathic Scoliosis

Spine (Phila Pa 1976). 2018 Jan 15;43(2):127-132. doi: 10.1097/BRS.0000000000001978.
Djurasovic M, Glassman SD, **Sucato DJ,** Lenke LG, Crawford CH 3rd, Carreon LY

Study Design: Longitudinal cohort.

Objective: To investigate whether patients with painful adolescent idiopathic scoliosis experience pain relief with surgical treatment.

Summary of Background Data: Adolescent idiopathic scoliosis (AIS) was previously thought to be a painless condition, but recent studies have shown that a significant proportion of patients have pain. Little information is available regarding pain relief with surgical treatment for AIS.

Methods: Patients enrolled in a prospective database of surgically treated AIS were divided into two groups based on their preoperative Scoliosis Research Society (SRS)-22R pain domain score. Patients with a preoperative pain domain score of 4 or more (N = 1005) were classified as nonpainful. If the preoperative pain domain score was less than 4 (N = 505), they were classified as painful. Demographics, SRS total and domain scores, and changes with treatment were compared for the two groups.

Results: The two groups had similar demographics and preoperative coronal curve magnitude. Patients with painful scoliosis experienced significant improvement in SRS-22R pain scores, from 3.29 preoperatively to 4.03 postoperatively (P < 0.000). Eighty-one percent of these patients reached the minimum clinically important difference threshold (0.20) for improvement in pain score. Painful scoliosis patients also had greater 2-year improvement in total and all domain scores than the nonpainful scoliosis patients (P < 0.000). Absolute values of SRS-22R total and domain scores were all greater at 2 years in the nonpainful group than the painful group.

Conclusion: Patients with AIS with substantial back pain can be cautiously counseled to expect significant improvement in pain level with surgical correction of their deformity, even if curve progression is the primary indication for surgery. Although these patients achieve greater improvements in health-related quality of life compared with patients with mild or no pain, 2-year SRS-22R scores were still better in patients with mild or no pain preoperatively.

Patellofemoral Instability in the Skeletally Immature Patient: A Review and Technical Description of Medial Patellofemoral Ligament Reconstruction in Patients With Open Physes

Am J Orthop (Belle Mead NJ). 2018 Dec;47(12). doi: 10.12788/ajo.2018.0110.
Ellis HB Jr., Dennis G, **Wilson PL**

Abstract: Patellofemoral instability commonly occurs in the young patient, and, often, skeletal immaturity may be a risk factor for possible recurrence. Treatment considerations, including operative and nonoperative management, are based on anatomic factors. A medial patellofemoral ligament (MPFL) reconstruction is a treatment option for a skeletally immature patient with recurrent instability or for patients with a high risk of patellofemoral instability recurrence. A physeal-sparing MPFL reconstruction technique that considers the origin of the MPFL to be distal to the distal femoral physis may be employed.

The Importance of a Standardized Screening Tool to Identify Thromboembolic Risk Factors in Pediatric Lower-Extremity Arthroscopy Patients

J Am Acad Orthop Surg. 2019 Jan 7. doi: 10.5435/JAAOS-D-18-00390. [Epub ahead of print]
Ellis HB Jr., Sabatino MJ, Clarke Z, Dennis G, Fletcher AL, Wyatt CW, Zia A, **Wilson PL**

Introduction: Deep vein thrombosis and pulmonary embolism are major complications that can occur in common orthopaedic procedures such as knee arthroscopy. The purpose of this study is to determine the incidence of venous thromboembolism (VTE) risk factors in adolescent patients undergoing elective lower-extremity arthroscopy. A second objective is to determine whether a targeted, standardized screening tool is both cost- and clinically effective in the identification of VTE risk factors in adolescents.

Methods: A standardized VTE screening tool was prospectively administered to all elective arthroscopic procedures in a pediatric sports medicine practice. A comparison cohort that did not complete the screening tool was isolated through a retrospective chart review identifying VTE risk factors. The incidence and cost between the two cohorts were compared.

Results: Of 332 subjects who did not receive a targeted screening (TS) tool, 103 risk factors were noted. One pulmonary embolism case was identified with a total incidence of 0.15% over 3 years. With TS, we identified 325 subjects with 134 identifiable risk factors. Six patients (1.8%) were noted to be very high risk, requiring consultation with hematology. No VTEs were reported. When compared with the retrospective review, TS identified 30% more risk factors. A significant increase in the identification of family history of blood clots ($P < 0.001$), history of previous blood clot ($P = 0.059$), recurrent miscarriages in the family ($P = 0.010$), and smoking exposure ($P = 0.062$) was found. Additionally, the total cost of screening was less than the cost of prophylaxis treatment with no screening ($20.98 versus $23.51 per person, respectively).

Discussion: Risk factors for VTE may be present in 32.5% of elective adolescent arthroscopic patients. A TS model for VTE identified 30% more risk factors, especially a significant family history, and was shown to be a cost-effective way to safely implement a VTE prevention program.

Macrodactyly: Decision-Making and Surgery Timing

J Hand Surg (Eur vol.) 2019 Jan;44(1):32-42. doi: 10.1177/1753193418796441. Epub 2018 Sep 12.
Ezaki M, Beckwith T, **Oishi SN**

Abstract: Macrodactyly is a rare condition in which fingers, hands, or limb growth is unregulated, resulting in overgrowth of tissues in the affected extremities. It is critical to properly assess these extremities for signaling pathway, psychological impact, and potential surgical intervention to achieve the best possible outcome for each patient. Treatment approaches can vary, and patient and family expectations weigh heavily on care complexity. Common surgical procedures include epiphysiodeses, osteotomies, debulking procedures, carpal tunnel releases, toe transfers, and amputations. The selection and timing of these surgeries is a vital component of the approach, as delayed healing and excessive scarring may occur. The purpose of this review is to assist in the navigation of decision-making and surgical timing for patients presenting with overgrowth manifesting itself as macrodactyly.

Distal Junctional Failure Following Pediatric Spinal Fusion

J Pediatr Orthop. 2019 Apr;39(4):202-208. doi: 10.1097/BPO.0000000000000898.
Floccari LV, Su AW, **McIntosh AL, Rathjen K,** Shaughnessy WJ, Larson AN

Background: Adjacent segment pathology is a known complication after spinal fusion, but little has been reported on junctional failure. A series of adolescent patients presented with acute distal junctional failure (DJF). We sought to determine any common features of these patients to develop a prevention strategy.

Methods: A retrospective review was conducted of pediatric patients who developed DJF after instrumented spinal fusion performed at 2 institutions from 1999 to 2013. Patients with proximal junctional failure or junctional kyphosis without failure were excluded.

Results: Fifteen subjects were identified with mean follow-up of 38 months. Distal failure occurred a mean of 60 days after index surgery, with history of minor trauma in 4 patients. Failures included 3-column Chance fracture (11) or instrumentation failure (4). Thirteen patients presented with back pain and/or acute kyphosis, whereas 2 asymptomatic patients presented with healed fractures. Two patients also developed new onset of severe lower extremity neurological deficit after fracture, which improved but never resolved after revision. A total of 13/15 subjects required revision surgery, typically within 1 week. Complications associated with revision surgery were encountered in 8 patients (62%). Major complications that required return to the operating room included 2 deep infections, 2 instrumentation failures, and dense lower-extremity paralysis that improved after medial screw revision and decompression. At final follow-up, 10 patients are asymptomatic, 2 have persistent neurological deficit, 2 have chronic pain, and 1 has altered gait with gait aid requirement.

Conclusions: This study analyzes a heterogenous cohort of spinal fusion patients who developed DJF from 3-column Chance fracture or instrumentation failure. Revision surgery is typically required but has a high complication rate and can result in severe neurological deficit, highlighting the morbidity of this complication. It is unclear whether level of the lowest instrumented vertebra contributes to DJF. Increased awareness of junctional failure in children may prompt additional studies to further characterize risk factors and preventative strategies.

Latissimus Dorsi Tendon Rupture

J Am Acad Orthop Surg. 2019 Feb 15;27(4):113-118. doi: 10.5435/JAAOS-D-17-00581.
George MS, **Khazzam M**

Abstract: Isolated injury to the latissimus dorsi is rare. Partial tendon tears may be successfully treated nonsurgically. Complete tendon ruptures require surgical repair. Tendon repair can be approached either through an anterior deltopectoral incision with a secondary small posterior axillary incision or through a long posterior axillary incision. Suture anchors can be used to repair the latissimus dorsi to the humeral attachment. Although the literature is limited to single-patient case series, most patients have returned to full athletic activity after surgical repair.

Does Severity of Acetabular Dysplasia Influence Clinical Outcomes After Periacetabular Osteotomy? A Case-Control Study

J Arthroplasty. 2018 Jul;33(7S):S66-S70. doi: 10.1016/j.arth.2018.03.028. Epub 2018 Mar 17.
Grammatopoulos G, Beaulé PE, Pascual-Garrido C, Nepple JJ, **ANCHOR Group,** Clohisy JC

Background: Detailed characterization of factors influencing post-periacetabular osteotomy (PAO) outcome could guide treatment offered.

Methods: Using a prospective, multicenter database of PAOs, 61 hips/patients (51 females) with lesser dysplasia (acetabular index < 15° and lateral center-edge angle > 15°) were case-control matched for age, gender, body mass index, Tönnis grade, and joint congruency ($P = .6$-$.9$) with a "comparison group" of pronounced dysplasia ($n = 183$), aiming to assess whether severity of acetabular dysplasia has an effect on outcome following PAO and/or the ability to achieve desired acetabular correction.

Results: At 4 ± 1.5 years, no differences in complication or reoperation rates were detected between the groups ($P = .29$). Lesser dysplastic hips had inferior Hip Disability and Osteoarthritis Outcome Scores, both preoperatively (52 vs. 59) and postoperatively (73 vs. 78); however, similar improvements were seen. Among the lesser dysplastic hips, those that required a femoral osteochondroplasty at PAO had

a significantly inferior preoperative Hip Disability and Osteoarthritis Outcome Score (48 ± 18). Increased ability to achieve optimum correction was seen (80% vs. 59%, P = .4) in lesser dysplasia.

Conclusion: A PAO is safe and efficacious in the treatment of lesser dysplasia. Further study on the identification of the optimum treatment modality for the mildly dysplastic hips with cam deformity is required.

New Concepts of Radiologic Preoperative Evaluation of Anterior Shoulder Instability: On-Track and Off-Track Lesions

Acta Radiol. 2018 Aug;59(8):966-972. doi: 10.1177/0284185117745573. Epub 2017 Dec 7.
Gulati A, Dessouky R, Wadhwa V, **Sanders D, Chhabra A**

Abstract: The shoulder is the most frequently dislocated joint in the body due to a larger range of motion and a small area of articulation between the humeral and glenoid surfaces. Traumatic shoulder dislocations, especially those associated with injury to the labroligamentous or bony stabilizers of the joint, lead to further reduction of articular surface contact with resultant glenohumeral instability and recurrent shoulder dislocations. Imaging plays an increasingly important role in the preoperative evaluation of patients with traumatic shoulder instability by evaluating glenohumeral bone loss (uni- or bipolar), assessing soft tissue injuries, and identifying patients at risk of postoperative recurrence. Quantification of bone loss is key to differentiate engaging vs. nonengaging Hill-Sachs lesions, while newer concepts of “on-track” vs. “off-track” lesions are being discussed that can determine the required surgical approaches. In this article, we review the preoperative imaging approaches and traditional treatments, outline the bone loss measurement strategies, and review these new tracking concepts with relevant case examples.

Current Clinical, Radiological, and Treatment Perspectives of Patellofemoral Pain Syndrome

Br J Radiol. 2018 Jun;91(1086):20170456. doi: 10.1259/bjr.20170456. Epub 2018 Jan 22.
Gulati A, McElrath C, Wadhwa V, **Shah JP, Chhabra A**

Abstract: Anterior knee pain in active young adults is commonly related to patellofemoral pain syndrome, which can be broadly classified into patellar malalignment and patellar maltracking. Imaging is performed to further elucidate the exact malalignment and maltracking abnormalities and exclude other differentials. This article details the role of the stabilizers of the patellofemoral joint, findings on conventional and multimodality imaging aiding in patellofemoral pain syndrome diagnosis and characterization, and current perspectives of various treatment approaches.

Trends of Hip Arthroscopy in the Setting of Acetabular Dysplasia

J Hip Preserv Surg. 2018 Sep 7;5(3):267-273. doi: 10.1093/jhps/hny026. eCollection 2018 Aug.
Haynes JA, Pascual-Garrido C, An TW, Nepple JJ, **ANCHOR Group,** Clohisy JC

Abstract: Hip arthroscopy is increasingly utilized in the treatment of symptomatic intra-articular hip pathology. Unaddressed development dysplasia of the hip (DDH) is thought to be associated with failure after hip arthroscopy. The aims of this study were (i) to identify the prevalence of previous failed hip arthroscopy in patients undergoing a periactebaular osteotomy (PAO) for the treatment of symptomatic acetabular dysplasia, (ii) report on the temporal trend of failed ipsilateral hip arthroscopy in patients undergoing PAO, and (iii) to determine clinical and radiographic characteristics associated with utilization of isolated hip arthroscopy in patients with acetabular dysplasia. We identified 139 patients undergoing PAO who had a history of a prior ipsilateral hip arthroscopy. A comparison group of 1,505 patients with a diagnosis of acetabular dysplasia who underwent PAO alone without any prior ipsilateral surgery during the study period was used. Clinical characteristics, radiographic, and intraoperative findings were compared between cohorts. From 2008 to 2015, the rate of previous failed hip arthroscopy in patients undergoing subsequent PAO increased steadily until 2013 with a maximum of 12%. Patients in the study group had mild dysplasia with significantly higher LCEA (17.2° versus 11.3°; P < 0.001) and ACEA (15.6° versus 10.8°; P < 0.001) and a lower acetabular inclination (14.0° versus 19.0°; P < 0.001). The findings illustrate a constant increase in the rate of failed hip arthroscopy in the setting of acetabular dysplasia from 2008 to 2013. Female sex and mild dysplasia were associated with use of isolated hip arthroscopy in the setting of acetabular dysplasia.

Multi-Parametric Muscle and Fat Correlation of Computed Tomography Parameters to Outcomes in a Total Hip Arthroplasty Population

BMC Musculoskelet Disord. 2018 Jan 8;19(1):4. doi: 10.1186/s12891-017-1926-1.
Heffler MA, Barlow R, Xi Y, Hayashi D, Box H, **Huo M, Chhabra A**

Background: Cross-sectional imaging is not currently used in planning total hip arthroplasty (THA). The aim of our study is to determine correlations between CT parameters and outcomes following THA.

Methods: A prospective registry of patients who underwent total joint arthroplasty was reviewed for patients who: (1) underwent THA, (2) had a CT between 1 year before and 6 months after surgery, and (3) completed perioperative WOMAC and Harris Hip Score (HHS) questionnaires. Two readers measured CT parameters, yielding mean Hounsfield Units and area, average diameter, and perimeter of the psoas major, gluteus medius, and minimus muscles. A segmentation algorithm determined visceral and subcutaneous fat area and waist circumference. ICC was calculated for each measurement to examine inter-reader agreement. Regression analyses were performed to select measurements with most impact on outcome scores.

Results: Twenty-eight patients met inclusion criteria (17 female, 11 male), having mean (+/- standard deviation) age of 54.4 +/- 14.8 years and BMI 29.0 +/- 6.3 kg/m^2. Correlations were found between HHS and age (0.650, p = 0.018), height (-1.263, p = 0.009), visceral-to-subcutaneous fat area ratio at the psoas level (0.511, p = 0.018), and waist circumference at the psoas level (1.759, p = 0.002). Inter-reader analysis showed ICC > 0.850 for all measurements.

Conclusion: Age and height, as well as CT-derived visceral-to-subcutaneous fat area ratio and waist circumference significantly correlate with postsurgical HHS scores following THA. Our study suggests that parameters derived from cross-sectional CT imaging can be a useful additional preoperative planning tool for THA.

Point vs. Traditional Method Evaluation of Hallux Valgus: Inter-Reader Reliability and Intermethod Performance Using X-Ray and MRI

Skeletal Radiol. 2019 Feb;48(2):251-257. doi: 10.1007/s00256-018-3022-5. Epub 2018 Jul 12.
Heineman N, **Chhabra A,** Zhang L, Dessouky R, **Wukich D**

Background: The two most widely used measurements for diagnosing and assessing the severity of hallux valgus are the hallux valgus angle (HVA) and the intermetatarsal angle (IMA). Traditionally, these have been measured by using the midaxial lines approximating the axis of each bone. A new simpler point method has been recently suggested for measuring these angles by connecting points along the medial corners of each bone. Inter-reader reliability of these measurements on X-ray and MRI as well as intermethod and intermodality differences have not been assessed.

Methods: A series of 56 consecutive patients between 18 and 100 years old with no history of foot trauma or orthopedic hardware in their feet were included. All had AP and lateral X-rays and MRI performed on the same foot between April 27, 2015, and March 9, 2016. Two readers measured HVA and IMA using both the traditional midaxial and new point methods. ICC correlations were obtained.

Results: The inter-reader reliability for HVA was similar on point method (0.92) and traditional method (0.94). For the IMA, the ICC was 0.77 on point method versus 0.76 on traditional method. The intermodality agreement (between X-ray and MRI) was higher for HVA (ICC = 0.85, 0.88) as compared to IMA (0.58, 0.74), respectively on both methods. The mean difference between the methods was larger on traditional method = 5.5 for HVA and 2.5° for IMA.

Conclusions: HVA is more reliable than IMA on both methods and modalities and a significant difference exists between the magnitudes of values obtained using the two methods.

Hallux Valgus Evaluation on MRI: Can Measurements Validated on Radiographs Be Used?

J Foot Ankle Surg. 2018 Mar - Apr;57(2):305-308. doi: 10.1053/j.jfas.2017.10.009. Epub 2018 Jan 11.
Heineman N, Xi Y, Zhang L, Dessouky R, Hummel J, Skweres J, **Wukich D, Chhabra A**

Abstract: Hallux valgus (HV) is a common deformity of the great toe affecting > 23% of adults in the United States. The severity of the deformity is traditionally analyzed using radiographs to determine measurements such as the HV and intermetatarsal angles. We sought to determine the relationship between the radiographic and magnetic resonance imaging (MRI) measurements because this is not yet known. Two of us analyzed a series of 56 consecutive patients who had had radiographs and MRI performed on the same foot between April 27, 2015, and March 9, 2016, and who satisfied all other inclusion and exclusion criteria (age 18 to 100 years, no history of recent foot trauma, and no metal hardware in the foot). We found excellent inter-reader reliability (intraclass correlation 0.89 to 0.96) and intermodality agreement (intraclass correlation 0.83 to 0.91). The HV angle measured 15.0° ± 8.8° on the MRI scans and 13.8° ± 8.7° on the radiographs (mean difference -1.15° ± 3.89°), and the intermetatarsal angle was 9.0° ± 3.1° on the MRI scans and 8.8° ± 2.9° on the radiographs (mean difference -0.22° ± 2.10°). The HV measurements were reliable on both radiographs and MRI for the range of values tested. Small intermodality statistically significant differences in HV angle measurements were found; however, these might not be enough to be clinically significant.

Bactericidal Efficacy of Hydrogen Peroxide on Cutibacterium Acnes

Bone Joint Res. 2019 Feb 2;8(1):3-10. doi: 10.1302/2046-3758.81.BJR-2018-0145.R1. eCollection 2019 Jan.
Hernandez P, Sager B, Fa A, Liang T, Lozano C, **Khazzam M**

Objectives: The purpose of this study was to examine the bactericidal efficacy of hydrogen peroxide (H_2O_2) on Cutibacterium acnes (C. acnes). We hypothesize that H_2O_2 reduces the bacterial burden of C. acnes.

Methods: The effect of H_2O_2 was assessed by testing bactericidal effect, time course analysis, growth inhibition, and minimum bactericidal concentration. To assess the bactericidal effect, bacteria were treated for 30 minutes with 0%, 1%, 3%, 4%, 6%, 8%, or 10% H_2O_2 in saline or water and compared with 3% topical H_2O_2 solution. For time course analysis, bacteria were treated with water or saline (controls), 3% H_2O_2 in water, 3% H_2O_2 in saline, or 3% topical solution for 5, 10, 15, 20, and 30 minutes. Results were analyzed with a two-way analysis of variance (ANOVA) ($p < 0.05$).

Results: Minimum inhibitory concentration of H_2O_2 after 30 minutes is 1% for H_2O_2 prepared in saline and water. The 3% topical solution was as effective when compared with the 1% H_2O_2 prepared in saline or water. The controls of both saline and water showed no reduction of bacteria. After five minutes of exposure, all mixtures of H_2O_2 reduced the percentage of live bacteria, with the topical solution being most effective ($p < 0.0001$). Maximum growth inhibition was achieved with topical 3% H_2O_2.

Conclusion: The inexpensive and commercially available topical solution of 3% H_2O_2 demonstrated superior bactericidal effect as observed in the minimum bactericidal inhibitory concentration, time course, and colony-forming unit (CFU) inhibition assays. These results support the use of topical 3% H_2O_2 for five minutes before surgical skin preparation prior to shoulder surgery to achieve eradication of C. acnes for the skin.

Soft Tissue Injury Severity Is Associated With Neurovascular Injury in Pediatric Supracondylar Humerus Fractures

J Pediatr Orthop. 2018 Oct;38(9):443-449. doi: 10.1097/BPO.0000000000000855.
Ho CA, Podeszwa DA, Riccio AI, Wimberly RL, Ramo BA

Background: Neurovascular injury in pediatric supracondylar fractures (SCHFx) has been associated with fracture classification but not with soft tissue injury. The purpose of this study is to correlate clinical soft tissue damage to neurovascular injuries in SCHFx.

Methods: This is an Institutional Review Board-approved prospective study from January 2010 through December 2013 of 748 operatively treated pediatric SCHFx. Prospective data were gathered both preoperatively and intraoperatively regarding detailed neurovascular examination as well as soft tissue status, with qualitative descriptives for swelling (mild/moderate/severe), ecchymosis, abrasions, skin tenting, and skin puckering.

Results: A total of 7.8% of patients (41/526) had a nonpalpable radial pulse preoperatively. Compared with those with a palpable pulse, a nonpalpable pulse was associated with severe elbow swelling ($P < 0.0001$), tenting ($P = 0.0085$), puckering ($P = 0.0011$), ecchymoses ($P < 0.0001$), and open fracture ($P = 0.044$). Ten patients had a loss of a palpable pulse from initial orthopaedic consult to time of surgery, and when compared with the patients who did not have a loss of pulse, this was associated with swelling severity ($P = 0.0001$) and ecchymosis ($P = 0.053$). A total of 14% of patients (71/526) had a neurological injury preoperatively, and this was associated with severe elbow swelling ($P < 0.0001$), tenting ($P = 0.0008$), puckering ($P = 0.0077$), and ecchymoses ($P < 0.0001$) when compared with patients who did not have a neurological injury. In total, 17 patients had a decline in their neurological examination from the time of initial orthopaedic consult to the time of surgery, and this was associated with severe elbow swelling ($P = 0.0054$) and ecchymoses ($P = 0.011$). After multivariate logistic regression analysis, severe swelling and ecchymoses were significantly associated with a nonpalpable pulse as well as neurological injury ($P < 0.05$). No patient had compartment syndrome.

Conclusions: Soft tissue injury, as measured by swelling, ecchymosis, puckering, and tenting, had a clinically significant association with neurovascular compromise in pediatric SCHFx, and assessment of soft tissue injury is as important as the radiographic appearance when examining these patients. The physical examination signs of soft tissue injury may play a factor in determining urgency of surgical treatment in these fractures.

Pediatric Orthopaedic Trauma: An Evidence-Based Approach

Orthop Clin North Am. 2018 Apr;49(2):195-210. doi: 10.1016/j.ocl.2017.11.008. Epub 2017 Dec 14.
Hubbard EW, **Riccio AI**

Abstract: The management of pediatric fractures has evolved over the past several decades, and many injuries that were previously being managed nonoperatively are now being treated surgically. The American Academy of Orthopaedic Surgeons has developed clinical guidelines to help guide decision-making and streamline patient care for certain injuries, but many topics remain controversial. This article analyzes the evidence regarding management of 5 of the most common and controversial injuries in pediatric orthopaedics today.

Retrograde Stainless Steel Flexible Nails Have Superior Resistance to Bending in Distal Third Femoral Shaft Fractures

J Pediatr Orthop. 2019 Apr;39(4):e258-e263. doi: 10.1097/BPO.0000000000001301.
Hubbard EW, Thompson RM, Jo CH, Pierce WA, **Riccio AI, Wimberly RL**

Background: It has been shown that retrograde titanium flexible intramedullary nails (Ti FIN) provide superior resistance to bending compared to antegrade Ti FIN in distal femur fractures. The purpose of this study was to compare resistance to torsional and bending forces of stainless steel (SS) FIN, with or without a locking screw, and Ti FIN in distal third femoral shaft fractures. We hypothesize that locked retrograde SS FIN will demonstrate greater resistance to both bending and torsional forces.

Methods: Thirty adolescent synthetic femur models were used to simulate transverse distal femoral fractures at either 60 mm or 90 mm proximal to the distal femoral physis. The femurs were instrumented with antegrade Ti FIN, antegrade SS FIN, retrograde Ti FIN, retrograde SS FIN, or retrograde locked SS FIN. Three models for each construct at both osteotomy levels were tested. Models were analyzed to determine maximum resistance to bending and torsion.

Results: In fractures 60 mm from the physis, retrograde SS FIN demonstrated statistically superior resistance to bending when compared with both antegrade and retrograde Ti FIN ($P = 0.001$ and 0.008, respectively) and antegrade SS FIN ($P = 0.0001$). Locked SS constructs showed a trend toward greater resistance to bending forces when compared with unlocked constructs ($P > 0.05$). No significant difference was seen in resistance to bending when fractures were 90 mm proximal to the distal femoral physis between the five groups. No significant differences were observed in resistance to torsion in either the proximal or distal fracture models, regardless of construct type.

Conclusions: Retrograde SS FIN confer significantly greater resistance to bending forces for fractures 60 mm proximal to the distal femoral physis compared with Ti FIN or antegrade entry SS FIN. In fractures 90 mm from the physis, no differences were noted in our model. Our results support the use of retrograde SS nails in the pediatric patient with distal femoral shaft fractures.

Development of the HOOSglobal to Assess Patient-Reported Outcomes in Patients Undergoing Hip Preservation Procedures

Am J Sports Med. 2018 Mar;46(4):940-946. doi: 10.1177/0363546517749585. Epub 2018 Jan 18.
Jacobs CA, Peabody MR, Duncan ST, Muchow RD, Nunley RM, **ANCHOR Group,** Clohisy JC, Beaule PE, Kim YJ, Millis MB, **Podeszwa DA,** Schoenecker PL, Sierra RJ, Sink EL, **Sucato DJ,** Trousdale RT, Zaltz I

Background: The creation of a single patient-reported outcome (PRO) platform validated across hip preservation, osteoarthritis (OA), and total hip arthroplasty (THA) populations may reduce barriers and streamline the routine collection of PROs in clinical practice. As such, the purpose of this study was to determine if augmenting the Hip disability and Osteoarthritis Outcome Score-Joint Replacement (HOOS, JR) with additional HOOS questions would result in a PRO platform that could be used across a wider spectrum of hip patient populations.

Hypothesis: The HOOS, JR would demonstrate a notable ceiling effect, but by augmenting the HOOS, JR with additional HOOS questions, a responsive PRO platform could be created.

Study Design: Cohort study (diagnosis); level of evidence, 2.

Methods: Using preoperative and postoperative HOOS responses from a sample of 304 patients undergoing periacetabular osteotomy (PAO), additional items were identified to augment the HOOS, JR. The psychometric properties of a newly created PRO tool (HOOSglobal) were then compared with the HOOS, JR and other PRO instruments developed for patients with hip OA and/or undergoing THA.

Results: By augmenting the HOOS, JR with 2 additional questions, the HOOSglobal was more responsive than all other included PRO tools and had significantly fewer maximum postoperative scores than the HOOS, JR ($P < .0001$), HOOS-Physical Function Short Form ($P < .0001$), Western Ontario and McMaster Universities Osteoarthritis Index ($P = .02$), University of California, Los Angeles activity scale ($P = .0002$), and modified Harris Hip Score ($P = .04$). The postoperative HOOSglobal score threshold associated with patients achieving the patient acceptable symptom state (PASS) was 62.5.

Conclusion: The HOOSglobal is a valid and responsive PRO tool after PAO and may potentially provide the orthopaedic community with a PRO platform to be used across hip-related subspecialties. For patients undergoing PAO, a postoperative HOOSglobal score ≥ 62.5 was associated with patients achieving the PASS.

Functional Outcomes Following Treatment for Clubfoot: Ten-Year Follow-Up

J Bone Joint Surg Am. 2018 Dec 5;100(23):2015-2023. doi: 10.2106/JBJS.18.00317.
Jeans KA, **Karol LA,** Erdman AL, Stevens WR Jr.

Background: The purpose of this study was to assess function, at the age of 10 years, of children initially treated nonoperatively for clubfoot with either the Ponseti or French physiotherapy program and to compare outcomes in feet that had undergone only nonoperative treatment with those that required subsequent surgery.

Methods: Gait analysis, isokinetic ankle strength, parent-reported outcomes, and daily step activity data were collected when patients who had been treated for idiopathic clubfoot reached the age of 10 years. Patients who had undergone only nonoperative treatment were compared with those who subsequently underwent extra-articular surgery or intra-articular surgery (posterior release or posteromedial release). The clubfoot groups were compared with age-matched controls.

Results: Of 263 treated clubfeet in 175 patients, 148 had been treated only nonoperatively, 29 underwent extra-articular surgery, and 86 underwent intra-articular surgery (posterior release in 42 and posteromedial release in 44). Significant abnormalities were found in ankle kinetics and isokinetic ankle strength in the feet treated with intra-articular surgery compared with the nonoperatively treated feet ($p < 0.017$). Compared with controls ($n = 40$ feet), all groups showed reduced ankle plantar flexion during gait, resulting in a deficit of 9% to 14% for dynamic range of motion, 13% to 20% for ankle moment, and 13% to 23% for power ($p < 0.013$). Within the intra-articular group, feet that underwent posteromedial release had decreased plantar flexion strength (15%; $p = 0.008$), dorsiflexion strength (6%; $p = 0.048$), and parent-reported global function scores ($p = 0.032$) compared with the posterior release group. The patients with clubfoot took 10% fewer steps ($p = 0.015$) and had 11% less total ambulatory time ($p = 0.001$) than the controls.

Conclusions: Examination of patients when they had reached the age of 10 years showed better ankle power and isokinetic strength for clubfeet treated without surgery compared with those that underwent intra-articular surgery for residual deformity or recurrence. Compared with controls, both nonoperatively and surgically treated clubfeet had significant limitations in ankle plantar flexion resulting in decreased range of motion, moment, and power. Gastrocnemius-soleus complex strength was decreased after both nonoperative and surgical treatment of clubfeet. Although activity was diminished in the clubfoot population, no differences in function were perceived by the patients' parents.

Quantitative MRI Helps to Detect Hip Ischemia: Preclinical Model of Legg-Calvé-Perthes Disease

Radiology. 2018 Nov;289(2):386-395. doi: 10.1148/radiol.2018180497. Epub 2018 Jul 31.
Johnson CP, Wang L, Tóth F, Aruwajoye O, Carlson CS, **Kim HKW,** Ellermann JM

Purpose: To determine whether quantitative MRI relaxation time mapping techniques can help to detect ischemic injury to the developing femoral head.

Materials and Methods: For this prospective animal study conducted from November 2015 to February 2018, 10 male 6-week-old piglets underwent an operation to induce complete right femoral head ischemia. Animals were humanely killed at 48 hours (n = 2) or 4 weeks (n = 8) after the operation, and the operated and contralateral-control femoral heads were harvested and frozen. Thawed specimens were imaged at 9.4-T MRI by using T1, T2, T1 in the rotating frame (T1ρ), adiabatic T1ρ, relaxation along a fictitious field (RAFF), and T2 mapping and evaluated with histologic analysis. Paired relaxation time differences between the operated and control femoral heads were measured in the secondary ossification center (SOC), epiphyseal cartilage, articular cartilage, and metaphysis and were analyzed by using a paired t test.

Results: In the SOC, T1ρ and RAFF had the greatest percent increases in the operated versus control femoral heads at both 48 hours (112% and 72%, respectively) and 4 weeks (74% and 70%, respectively). In the epiphyseal and articular cartilage, T2, T1ρ, and RAFF were similarly increased at both points (range, 24%-49%). At 4 weeks, T2, T1ρ, adiabatic T1ρ, and RAFF were increased in the SOC (P = .004, .018, < .001, and .001, respectively), epiphyseal cartilage (P = .009, .008, .011, and .007, respectively), and articular cartilage (P = .005, .016, .033, and .018, respectively). Histologic assessment identified necrosis in the SOC and deep layer of the epiphyseal cartilage at both points.

Conclusion: T2, T1 in the rotating frame, adiabatic T1 in the rotating frame, and relaxation along a fictitious field map are sensitive in helping to detect ischemic injury to the developing femoral head.

Quantitative Susceptibility Mapping Detects Neovascularization of the Epiphyseal Cartilage After Ischemic Injury in a Piglet Model of Legg-Calvé-Perthes Disease

J Magn Reson Imaging. 2018 Dec 17. doi: 10.1002/jmri.26552. [Epub ahead of print]
Johnson CP, Wang L, Tóth F, Aruwajoye O, Kirkham B, Carlson CS, **Kim HKW,** Ellermann JM

Background: Legg-Calvé-Perthes disease (LCPD) is a childhood hip disorder thought to be caused by disruption of blood supply to the developing femoral head. There is potential for imaging to help assess revascularization of the femoral head.

Purpose: To investigate whether quantitative susceptibility mapping (QSM) can detect neovascularization in the epiphyseal cartilage following ischemic injury to the developing femoral head.

Study Type: Prospective.

Animal Model: Right femoral head ischemia was surgically induced in 6-week-old male piglets. The animals were sacrificed 48 hours (n = 3) or 4 weeks (n = 7) following surgery, and the operated and contralateral control femoral heads were harvested for ex vivo MRI.

Field Strength/Sequence: Preclinical 9.4T MRI to acquire susceptibility-weighted 3D gradient echo (GRE) images with 0.1 mm isotropic spatial resolution.

Assessment: The 3D GRE images were used to manually segment the cartilage overlying the femoral head and were subsequently postprocessed using QSM. Vessel volume, cartilage volume, and vessel density were measured and compared between operated and control femoral heads at each timepoint. Maximum intensity projections of the QSM images were subjectively assessed to identify differences in cartilage canal appearance, location, and density.

Statistical Tests: Paired t-tests with Bonferroni correction were used (P < 0.008 considered significant).

Results: Increased vascularity of the epiphyseal cartilage following ischemic injury was clearly identified using QSM. No changes were detected 48 hours after surgery. Vessel volume, cartilage volume, and vessel density were all increased in the operated vs. control femoral heads 4 weeks after surgery (P = 0.001, 0.002, and 0.001, respectively). Qualitatively, the increase in vessel density at 4 weeks was due to the formation of new vessels that were organized in a brush-like orientation in the epiphyseal cartilage, consistent with the histological appearance of neovascularization.

Data Conclusion: QSM can detect neovascularization in the epiphyseal cartilage following ischemic injury to the femoral head.

IL-6 Receptor Blockade Preserves Articular Cartilage and Increases Bone Volume Following Ischemic Osteonecrosis in Immature Mice

Osteoarthritis Cartilage. 2019 Feb;27(2):326-335. doi: 10.1016/j.joca.2018.10.010. Epub 2018 Nov 4.
Kamiya N, Kuroyanagi G, Aruwajoye O, **Kim HKW**

Objective: Juvenile ischemic osteonecrosis (JIO) of the femoral head is one of the most serious hip disorders causing a permanent deformity of the femoral head in childhood. We recently reported that interleukin-6 (IL-6) is predominantly increased in the hip synovial fluid of patients with JIO and that articular chondrocytes are a primary source of IL-6. This study investigated whether an inhibition of IL-6 receptor improves cartilage preservation and bone healing in JIO.

Method: A small animal model (i.e., 6-week-old mouse) of JIO was treated with either saline or tocilizumab, an IL-6 receptor blocker, for 6 weeks.

Results: TUNEL-positive chondrocytes in the articular cartilage were reduced by the tocilizumab treatment, concomitant with the increase in cartilage matrix. The levels of a cartilage anabolic marker Sox9 were significantly increased in the articular cartilage of mice treated with tocilizumab. Micro-CT assessment showed tocilizumab treatment significantly increased trabecular epiphyseal bone volume (P = 0.001, n = 10), thickness (P = 0.007), and number (P = 0.014) and decreased bone separation (P = 0.002) and its deformity (P = 0.003). A bone formation marker, BMP2, and an angiogenic marker, vascular endothelial growth factor (VEGF), were both significantly increased by tocilizumab treatment under hypoxia using human chondrocytes while the bone resorption marker, RANKL/OPG ratio, was reduced.

Conclusion: Tocilizumab treatment following ischemic osteonecrosis has a cartilage anabolic effect and increases bone volume in a JIO mouse model. The findings lead to a possible application of tocilizumab for preclinical study using a large animal model of JIO and a clinical trial to validate this treatment.

Oral Antibiotics Are Effective for the Treatment of Hand Osteomyelitis in Children

Hand (N Y). 2018 Aug 3:1558944718788666. doi: 10.1177/1558944718788666. [Epub ahead of print]
Kargel JS, **Sammer DM,** Pezeshk RA, Cheng J

Background: Acute osteomyelitis of the hand is common in the pediatric population. Treatment with intravenous antibiotics is expensive and is associated with catheter-site infection and thrombosis. The purpose of this study is to investigate the efficacy of managing osteomyelitis of the hand in children with oral antibiotics.

Methods: A retrospective review of cases of acute osteomyelitis of the hand at a single pediatric institution over a 4.5-year period was performed. Demographic and clinical data were reviewed, and treatment courses and outcomes were analyzed.

Results: In total, 21 patients with acute osteomyelitis of the hand were included in the study. Of the 21 patients, 17 were initiated on a 6-week course of oral antibiotics upon diagnosis. Thirteen

were successfully treated with oral antibiotics alone, 3 required subsequent surgical debridement, and 3 required conversion to intravenous antibiotics. Of the 21 patients, 4 were treated with surgical debridement upon diagnosis due to gross purulent drainage and then initiated on a 6-week course of oral antibiotics. All patients who underwent debridement were treated successfully with postoperative oral antibiotics.

Conclusions: Most cases of osteomyelitis of the hand in children can be treated with oral antibiotics, either as the primary treatment or as postoperative therapy. Surgical debridement is indicated when purulence is present at the time of initial diagnosis or if the infection progresses during treatment with oral antibiotics. The use of oral antibiotics for treating acute osteomyelitis of the hand in children may result in decreased cost and fewer catheter-associated complications.

Genome-Wide Meta-Analysis and Replication Studies in Multiple Ethnicities Identify Novel Adolescent Idiopathic Scoliosis Susceptibility Loci

Hum Mol Genet. 2018 Nov 15;27(22):3986-3998. doi: 10.1093/hmg/ddy306.
Khanshour AM, Kou I, Fan Y, Einarsdottir E, Makki N, Kidane YH, Kere J, Grauers A, Johnson TA, Paria N, Patel C, Singhania R, Kamiya N, Takeda K, Otomo N, Watanabe K, Luk KDK, Cheung KMC, **Herring JA,** Rios JJ, Ahituv N, Gerdhem P, Gurnett CA, Song YQ, Ikegawa S, **Wise CA**

Abstract: Adolescent idiopathic scoliosis (AIS) is the most common musculoskeletal disorder of childhood development. The genetic architecture of AIS is complex, and the great majority of risk factors are undiscovered. To identify new AIS susceptibility loci, we conducted the first genome-wide meta-analysis of AIS genome-wide association studies, including 7,956 cases and 88,459 controls from three ancestral groups. Three novel loci that surpassed genome-wide significance were uncovered in intragenic regions of the CDH13 (P-value_rs4513093 = 1.7E-15), ABO (P-value_ rs687621 = 7.3E-10), and SOX6 (P-value_rs1455114 = 2.98E-08) genes. Restricting the analysis to females improved the associations at multiple loci, most notably with variants within CDH13 despite the reduction in sample size. Genome-wide gene-functional enrichment analysis identified significant perturbation of pathways involving cartilage and connective tissue development. Expression of both SOX6 and CDH13 was detected in cartilage chondrocytes, and chromatin immunoprecipitation sequencing experiments in that tissue revealed multiple HeK27ac-positive peaks overlapping associated loci. Our results further define the genetic architecture of AIS and highlight the importance of vertebral cartilage development in its pathogenesis.

Diagnostic Accuracy of the Scapular Retraction Test in Assessing the Status of the Rotator Cuff

Orthop J Sports Med. 2018 Oct 4;6(10):2325967118799308. doi: 10.1177/2325967118799308. eCollection 2018 Oct.
Khazzam M, Gates ST, Tisano BK, Kukowski N

Background: Currently, clinical physical examination maneuvers alone provide variable reliability in diagnosing full-thickness rotator cuff tears (RCTs).

Purpose: To assess the diagnostic accuracy of the scapular retraction test (SRT) to predict full-thickness RCTs.

Study Design: Cohort study (diagnosis); level of evidence, 2.

Methods: A total of 331 patients were prospectively evaluated in this cohort study. SRT was performed to assess the status of the rotator cuff. A positive SRT indicates an intact rotator cuff, and a negative SRT indicates a full-thickness RCT. Magnetic resonance imaging (MRI) was used as the gold standard. The examiner was blinded to the results until completing the physical examination. Statistical analysis was performed to assess the sensitivity, specificity, accuracy, positive and negative predictive values, and positive and negative likelihood ratios of the SRT.

Results: The prevalence of full-thickness RCTs diagnosed on MRI was 54.4% (180 of 331). Among the 180 patients with an MRI-confirmed full-thickness RCT, the SRT was negative for 147. Of 150 patients with an intact rotator cuff by MRI, 122 had a positive SRT. In diagnosing full-thickness RCTs, the SRT had a sensitivity of 81.7% (95% CI, 77.2%-85.4%), specificity of 80.8% (95% CI, 75.5%-85.3%), and accuracy of 81.3%. The positive predictive value was 83.5% (95% CI, 78.9%-87.4%); the negative predictive value, 78.7% (95% CI, 73.5%-83.1%); the positive likelihood ratio, 4.3 (95% CI, 3.1-5.8); the negative likelihood ratio, 0.23 (95% CI, 0.17-0.30); and the diagnostic odds ratio, 18.7 (95% CI, 10.4-34.0).

Conclusion: The results of this diagnostic study indicate that the SRT can accurately be used to clinically assess the status of the rotator cuff. This physical examination maneuver was found to be accurate, sensitive, and specific in diagnosing full-thickness RCTs. Additionally, our results indicate that it is equally as accurate to predict an intact rotator cuff tendon. Providing an accurate, reliable, and reproducible physical examination test will allow clinicians to diagnosis the integrity of the rotator cuff and will help guide treatment recommendations.

Treatment Patterns and Outcomes of Stable Hips in Infants With Ultrasonic Dysplasia

J Am Acad Orthop Surg. 2019 Jan 15;27(2):68-74. doi: 10.5435/JAAOS-D-17-00233.
Kim HKW, Beckwith T, De La Rocha A, Zepeda E, Jo CH, **Sucato D**

Introduction: No clear practice guideline exists for the management of stable hip with ultrasonic dysplasia (UD). This study assessed the treatment patterns for stable UD and determined the outcomes of Pavlik harness (PH) treatment or observation (OB).

Methods: This is a prospective study of 80 infants (107 hips) aged ≤ 12 weeks at presentation diagnosed with stable UD.

Results: Sixty-five hips were treated with PH; 42 hips were observed. Patients who were older at the time of initial sonogram and those with lower head coverage were more likely to be treated with PH. The mean head coverage was lower in the PH group, indicating more severe UD. At a 2-year follow-up period, 93% of patients in the OB group and 87% in the PH group had a good radiographic outcome.

Discussion: Head coverage and age at first sonogram had a significant influence on the treatment decision for PH. A milder ultrasonic hip dysplasia can be observed because 93% of the patients who were observed had a good outcome.

Endoscopic Versus Open Carpal Tunnel Release: A Detailed Analysis Using Time-Driven Activity-Based Costing at an Academic Medical Center

J Hand Surg Am. 2019 Jan;44(1):62.e1-62.e9. doi: 10.1016/j.jhsa.2018.04.023. Epub 2018 Jun 11.
Koehler DM, Balakrishnan R, Lawler EA, Shah AS

Purpose: In order to effectively improve value in health care delivery, providers must thoroughly understand cost drivers. Time-driven activity-based costing (TDABC) is a novel accounting technique that may allow for precise characterization of procedural costs. The purpose of the present study was to use TDABC to characterize costs in a high-volume, low-complexity ambulatory procedure (endoscopic vs. open carpal tunnel release [CTR]), identify cost drivers, and inform opportunities for clinical improvement.

Methods: The costs of endoscopic and open CTR were calculated in a matched cohort investigation using TDABC. Detailed process maps including time stamps were created accounting for all clinical and administrative activities for both the endoscopic and the open treatment pathways on the day of ambulatory surgery. Personnel cost rates were calculated accounting for capacity, salary, and fringe benefits. Costs for direct consumable supplies were based on purchase price. Total costs were calculated by aggregating individual resource utilization and time data and were compared between the 2 surgical techniques.

Results: Total procedural cost for the endoscopic CTR was 43.9% greater than the open technique ($2,759.70 vs. $1,918.06). This cost difference was primarily driven by the disposable endoscopic blade assembly ($217), direct operating room costs related to procedural duration (44.8 vs. 40.5 minutes), and physician labor.

Conclusions: Endoscopic CTR is 44% more expensive than open CTR compared with a TDABC methodology at an academic medical center employing resident trainees. Granular cost data may be particularly valuable when comparing these 2 procedures, given the clinical equipoise of the surgical techniques. The identification of specific cost drivers with TDABC allows for targeted interventions to optimize value delivery.

A Multiethnic Meta-Analysis Confirms the Association of rs6570507 With Adolescent Idiopathic Scoliosis

Sci Rep. 2018 Aug 1;8(1):11575. doi: 10.1038/s41598-018-29011-7.
Kou I, Watanabe K, Takahashi Y, Momozawa Y, Khanshour A, Grauers A, Zhou H, Liu G, Fan YH, Takeda K, Ogura Y, Zhou T, Iwasaki Y, Kubo M, Wu Z, Matsumoto M, Japan Scoliosis Clinical Research Group (JSCRG), **Texas Scottish Rite Hospital for Children Clinical Group (TSRHCCG),** Einarsdottir E, Kere J, Huang D, Qiu G, Qiu Y, Wise CA, Song YQ, Wu N, Su P, Gerdhem P, Ikegawa S

Abstract: Adolescent idiopathic scoliosis (AIS) is the most common type of spinal deformity and has a significant genetic background. Genome-wide association studies (GWASs) identified several susceptibility loci associated with AIS. Among them is a locus on chromosome 6q24.1 that we identified by a GWAS in a Japanese cohort. The locus is represented by rs6570507 located within GPR126. To ensure the association of rs6570507 with AIS, we conducted a meta-analysis using eight cohorts from East Asia, Northern Europe, and the USA. The analysis included a total of 6,873 cases and 38,916 controls and yielded significant association (combined P = 2.95 × 10-20; odds ratio = 1.22), providing convincing evidence of the worldwide association between rs6570507 and AIS susceptibility. In silico analyses strongly suggested that GPR126 is a susceptibility gene at this locus.

Interleukin-6 Deletion Stimulates Revascularization and New Bone Formation Following Ischemic Osteonecrosis in a Murine Model

Bone. 2018 Nov;116:221-231. doi: 10.1016/j.bone.2018.08.011. Epub 2018 Aug 17.
Kuroyanagi G, Adapala NS, Yamaguchi R, Kamiya N, Deng Z, Aruwajoye O, Kutschke M, Chen E, Jo C, **Ren Y, Kim HKW**

Abstract: Legg-Calvé-Perthes disease (LCPD) is a childhood form of ischemic osteonecrosis of the femoral head, which can produce a permanent femoral head deformity and early osteoarthritis. The femoral head deformity results from increased bone resorption and decreased bone formation during repair and remodeling of the necrotic femoral head. A recent study showed that a pro-inflammatory cytokine, interleukin-6 (IL-6), is significantly elevated in the synovial fluid of patients with LCPD. We hypothesized that IL-6 elevation decreases bone formation during the repair process following ischemic osteonecrosis and that IL-6 depletion will increase new bone formation. To test this hypothesis, we surgically induced ischemic osteonecrosis in the wild-type (n = 29) and IL-6 knockout (KO) mice (n = 25). The animals were assessed at 48 h, 2 weeks, and 4 weeks following the induction of ischemic osteonecrosis using histologic, histomorphometric, and micro-CT methods. IL-6 immunohistochemistry showed high expression of IL-6 in the osteonecrotic side of the wild-type mice at 48 h and 4 weeks following ischemic osteonecrosis, but not in the IL-6 KO mice. We also confirmed an undetectable level of IL-6 expression in the primary osteoblasts of the IL-6 KO mice compared to the readily detectable level in the wild-type mice. Furthermore, we confirmed that IL-6 deletion did not affect the extent of bone necrosis in the IL-6 KO mice compared to the wild-type mice by performing histologic and terminal deoxynucleotidyl transferase mediated dUTP nick-end labeling (TUNEL) assessments at 2 weeks following the induction of ischemia. Both groups had the same extent of ischemic osteonecrosis and absence of repair at 2 weeks. At 4 weeks, the necrotic epiphyses showed a significant increase in the extent of revascularization in the IL-6 KO mice compared to the wild-type mice ($p = 0.001$). In addition, a significantly greater recovery of the hematopoietic bone marrow was observed in the osteonecrotic side of the IL-6 KO mice compared to the wild-type mice ($p < 0.01$). Vascular endothelial growth factor (VEGF) immunohistochemistry showed regionally increased staining in the areas of repair in the osteonecrosis side of IL-6 KO mice compared to the wild-type mice at 4 weeks following ischemic osteonecrosis. Micro-CT assessment of the wild-type mice at 4 weeks showed a significant decrease in the percent bone volume ($p < 0.01$) in the osteonecrotic side compared to the control side. In contrast, IL-6 KO mice showed significantly increased bone volume in the osteonecrotic side compared to the osteonecrotic side of WT mice ($p < 0.001$). No significant difference in the bone volume percentage was found between the control side of the wild-type and the IL-6 KO mice. Histomorphometric analysis at 4 weeks revealed increased osteoblast number/bone surface ($p < 0.001$), bone formation rate (BFR) ($p = 0.0001$), and mineral apposition rate (MAR) ($p < 0.0001$) in the osteonecrotic side of the IL-6 KO mice compared to the wild-type mice. The number of osteoclast/bone surface was also increased in the IL-6 KO mice compared to the wild-type mice ($p < 0.0001$). No significant difference was observed between the control side of the wild-type and IL-6 KO mice with regard to the number of osteoblast or osteoclast/bone surface, BFR, and MAR. We next obtained primary osteoblasts from IL-6 KO mice and showed they expressed a significantly higher level of RANKL/OPG than wild-type mice ($p = 0.001$) in hypoxia culture condition. Taken together, the findings indicate that IL-6 deletion stimulates revascularization and new bone formation following ischemic osteonecrosis. This study provides new evidence that therapeutic strategies to block IL-6 may be beneficial for bone healing following ischemic osteonecrosis.

Recurrence After Surgical Intervention for Infantile Tibia Vara: Assessment of a New Modified Classification

J Pediatr Orthop. 2019 Feb;39(2):65-70. doi: 10.1097/BPO.0000000000000933.
LaMont LE, **McIntosh AL,** Jo CH, **Birch JG, Johnston CE**

Objective: To propose a modified classification of infantile tibia vara based on the morphology of the metaphyseal/epiphyseal tibial slope that better correlates with treatment outcomes than the traditional Langenskiold classification.

Methods: We performed a retrospective review of 82 patients and 115 limbs that underwent surgery for infantile tibia vara over a 22-year period (1990 to 2012) at a single institution. A modified Langenskiold classification was applied to all patients preoperatively, and the outcomes were assessed. The modified system created a 3-stage classification (types A, B, and C): Type A has a partially lucent medial metaphyseal defect, with or without “beaking”; type B deformity has downward-sloping curvature of the lateral and inferior rim of a completely lucent metaphyseal defect, which then has an upslope at the medial rim, resembling a ski-jump, with no epiphyseal downward slope; type C has vertical, downsloping deformity of both the epiphysis and metaphysis, with no upward curvature projecting medially at the inferior extent, while the epiphysis slopes downward into the metaphyseal defect.

Results: Sixty-seven limbs did not develop recurrence following corrective osteotomy, whereas 48 limbs required at least 1 repeat surgery for recurrent deformity. Preoperative mechanical axis deviation, medial proximal tibial angle, lateral distal tibial angle, and body mass index did not differ significantly between those with recurrence and those without. Mean age at surgery was significantly different for those who

developed recurrence compared with those who did not. Patients without recurrence were 4.3 years of age (range, 2.4 to 10.3 y) compared with 6.2 years of age (range, 2.9 to 10.1 y) for those who recurred ($P < 0.01$). Of patients who developed recurrent deformity, there were significantly more patients with type C changes (71.7%, $P < 0.01$) than either type A (22.5%) or type B (20.7%). High rates of recurrence were seen for both Langenskiold stage III (50%) and stage IV (69.6%).

Conclusions: Consistent with prior studies, age 5 seems to be a critical transition in the risk for recurrent deformity after tibial osteotomy. Extreme vertical sloping of the medial metaphyseal defect, as in some classic Langenskiold III lesions and more precisely described by type C in a newer, modified classification, carries a poor prognosis for successful correction by high tibial osteotomy alone or in combination with epiphysiolysis.

Predictive Value and Interrater Reliability of Radiographic Factors in Neurofibromatosis Patients With Dystrophic Scoliosis

Spine Deform. 2018 Sep - Oct;6(5):560-567. doi: 10.1016/j.jspd.2018.02.011.
Larson AN, Ledonio CGT, Brearley AM, **Sucato DJ,** Carreon LY, Crawford AH, Stevenson DA, Vitale MG, Moertel CL, Polly DW Jr.

Background: Scoliosis in patients with neurofibromatosis type I (NF1) can manifest as dystrophic or nondystrophic curves. Dystrophic scoliosis is rapidly progressive, rendering treatment challenging. Radiographic characteristics have been reported to predict dystrophic scoliosis, but their reliability and predictive value have not been well described. The purpose of this study is to assess the interobserver reliability for eight radiographic characteristics of dystrophic scoliosis and to evaluate the sensitivity and specificity of these characteristics relative to the gold standard of a definitive clinical diagnosis.

Methods: Spine radiographs of 122 NF1 patients from multiple institutions were graded by five spine surgeons as dystrophic or nondystrophic, based on eight radiographic characteristics of dystrophic modulation: rib penciling, vertebral rotation, scalloping, wedging, spindling of transverse processes, short sharp angular curve, widened interpedicular distance, and atypical location. The curves were classified by each submitting institution as dystrophic or nondystrophic based on clinical outcome. Interobserver reliability analysis was performed using Fleiss kappa.

Results: For the 122 cases, the interrater agreement among the five readers for the diagnosis of dystrophic scoliosis was good at 0.61. The agreement for individual radiographic characteristic ranged from 0.62 for wedging to 0.14 (poor) for scalloping. Surgeons underestimated the number of dystrophic curves, rating from 45% to 67% of the curve patterns as dystrophic, compared to the gold standard, which revealed 68% of the curves to be dystrophic. On multivariate analysis, rib penciling, vertebral rotation, vertebral wedging, and atypical location were significantly associated with true dystrophic status (odds ratios of 2.4, 3.0, 2.4, and 3.0, respectively).

Conclusion: Overall dystrophic diagnosis can be assessed by radiographic characteristics. Better understanding of the predictive value of specific radiographic features may assist in early diagnosis of patients with dystrophic NF and assist surgeons in identifying dystrophic curve patterns and instituting prompt, appropriate treatment.

Open-Label Extension Phase of a Chronic Diabetic Foot Ulcer Multicenter, Controlled, Randomized Clinical Trial Using Cryopreserved Placental Membrane

Wounds. 2018 Sep;30(9):283-289. Epub 2018 Jun 29.
Lavery L, Fulmer J, Shebetka KA, Regulski M, Vayser D, Fried D, Kashefsky H, Owings TM, Nadarajah J, Hesp Z

Objective: The results of the single-arm, open-label extension phase of the Grafix (cryopreserved placental membrane; CPM; Osiris Therapeutics Inc, Columbia, MD) multicenter, blinded, randomized, controlled clinical trial for chronic diabetic foot ulcers (DFUs) are reported.

Materials and Methods: Twenty-six patients in the standard wound care (SWC) arm whose DFUs did not close in the blinded phase chose to receive weekly applications of the CPM in an open-label extension phase.

Results: In the extension phase, 17 (65.4%) patients closed their wounds in a median of 34 days and 3 visits. There were fewer total adverse events (AEs) (24 CPM vs. 52 SWC) and index wound-related infections (5 CPM vs. 12 SWC) during the CPM application compared with the number of AEs for the same patients during the SWC treatment in the blinded phase of the trial.

Conclusions: These results corroborate the benefits of this CPM combined with SWC over SWC alone for chronic DFUs previously reported for the blinded randomized phase of the trial, which directly relate to lower health care costs.

Does the Start of Dialysis Initiate a Period of Increased Risk of Ulceration or Amputation?

J Am Podiatr Med Assoc. 2018 Jan;108(1):1-5. doi: 10.7547/16-056.
Lavery LA, Lavery DC, Hunt NA, **Fontaine J,** Lavery RD

Background: Dialysis therapy is associated with an increased incidence of lower-extremity wounds and amputations. We compared the incidence of foot ulcers and amputations before and after the start of dialysis.

Methods: We evaluated 150 consecutive diabetic patients receiving dialysis and compared the incidence of foot complications 30 months before and after initiation of hemodialysis. We used claims data for diabetes, ulceration, and dialysis and abstracted medical records to verify diagnoses and dates of ulcers and amputations. We compared initial and cumulative ulcer/amputation incidence to account for multiple events in the same person over time. We used the same formula to determine the incidence rate difference and 95% confidence intervals (CIs) to compare new ulcers and amputations during the study.

Results: There was no significant difference in the incidence of first foot ulcers before (91.7 per 1,000 patient-years; 95% CI, 73.7-112.3 per 1,000 patient-years) and after (82.7; 95% CI, 65.7-102.3) the start of hemodialysis. The incidence of cumulative ulcers was significantly higher before (304.0 per 1,000 patient-years; 95% CI, 270.8-340.2) compared with after (210.7 per 1,000 patient-years; 95% CI, 183.0-240.9) dialysis. There was no difference in the incidence of first amputation before (29.3 per 1,000 patient-years; 95% CI, 1 9.4-41.7 per 1,000 patient-years) and after (37.3 per 1,000 patient-years; 95% CI, 19.4-41.7 per 1,000 patient-years) dialysis or in the cumulative incidence of amputations before (61.3 per 1,000 patient-years; 95% CI, 46.7-8.4 per 1,000 patient-years) and after (58.7 per 1,000 patient-years; 95% CI, 44.5-75.5 per 1,000 patient-years) dialysis.

Conclusions: There was no increase in the incidence of ulcers or amputations after beginning hemodialysis.

Pediatric Pelvic Ring Injuries

Orthopedics. 2018 Sep 1;41(5):e701-e704. doi: 10.3928/01477447-20180806-03. Epub 2018 Aug 10.
Lewallen LW, **McIntosh AL,** Sems SA

Abstract: The purpose of this study was to determine whether pelvic fracture pattern is associated with transfusion requirements or concomitant injuries in pediatric patients. This was a single-institution, retrospective review from 1970 to 2000. Pelvic ring injuries were classified using the Orthopaedic Trauma Association system. Injury Severity Scores were assigned. Ninety patients were included in this study. There were 27 A-type (30.0%), 51 B-type (56.7%), and 12 C-type (13.3%) injuries. Mean Injury Severity Scores were 8.1 for 61 A-type, 12.7 for 61 B-type, and 23.6 for 61 C-type fractures (P < .0001). Transfusion was required for 14.8% of A-type, 18.4% of B-type, and 66.7% of C-type injuries (P = .0009). There was no significant association with the number of units transfused (P = .9614). Decreased pelvic ring fracture stability was associated with an increased need for blood transfusion, although not with the number of units. Pelvic ring fracture stability may be a marker of associated injuries.

Differentiation of Deep Venous Thrombosis Among Children With or Without Osteomyelitis

J Pediatr Orthop. 2018 Nov/Dec;38(10):e597-e603. doi: 10.1097/BPO.0000000000001240.
Ligon JA, Journeycake JM, Josephs SC, Tareen NG, Lindsay EA, **Copley LAB**

Background: Children with osteomyelitis are at risk for deep venous thrombosis (DVT). This study evaluates the characteristics of DVT among children to differentiate between those with and without osteomyelitis.

Methods: Children with DVT of any cause were studied between 2008 and 2016. Children with DVT and osteomyelitis were compared with those with DVT without osteomyelitis. Another comparison cohort included children with osteomyelitis but without DVT. Comorbidities, severity of illness (SOI), and clinical course were compared between cohorts.

Results: DVT was identified in 224 children, a prevalence of 2.5 per 10,000 children. Among those with DVT, 28 (12.1%) had osteomyelitis. The DVT rate among 466 children with osteomyelitis was 6.0%. Children with osteomyelitis and DVT had greater SOI (9.1 vs. 2.7), bacteremia rate (82.1% vs. 38.4%), methicillin-resistant Staphylococcus aureus rate (89.3% vs. 21.2%), surgeries per child (2.1 vs. 0.7), and intensive care unit admission rate (67.9% vs. 5.9%) than that of children without DVT (P < 0.00001). Of 196 children who had DVT without osteomyelitis, 166 (84.7%) had comorbidities including defined hypercoagulability (27 or 13.8%). Children with DVT due to osteomyelitis were without comorbidities or hypercoagulability (P < 0.00001). The rate of pulmonary embolism was similar for children with DVT with or without osteomyelitis (3/28, or 10.7% vs. 18/196, or 9.2%).

Conclusions: Children with DVT and osteomyelitis differ substantially from other children with DVT by the absence of comorbidities or post-thrombotic syndrome. They also differ from children with osteomyelitis without DVT by higher SOI, methicillin-resistant S. aureus rate, and occurrence of intensive care. Awareness of the characteristics of DVT among children with osteomyelitis will reduce delay to diagnostic ultrasound and improve anticoagulation management, which must be carefully coordinated given the high rate of surgery of these children.

Three-Dimensional Computed Tomographic Characterization of Normal Anatomic Morphology and Variations of the Distal Tibiofibular Syndesmosis

J Foot Ankle Surg. 2018 Nov-Dec;57(6):1130-1136. doi: 10.1053/j.jfas.2018.05.013. Epub 2018 Sep 7.
Liu GT, Ryan E, Gustafson E, **VanPelt MD, Raspovic KM, Lalli T, Wukich DK,** Xi Y, **Chhabra A**

Abstract: Malreduction of distal tibiofibular syndesmosis (DTFS) leads to poor functional outcomes after ankle fracture surgery. Difficulty achieving anatomic alignment of the syndesmosis is due to variable morphology of the fibular incisura of the tibia and a paucity of literature regarding its morphologic characteristics. We surveyed 775 consecutive ankle computed tomography (CT) scans performed from June 2008 to December 2011, and 203 (26.2%) were included for evaluation. Two observers performed quantitative measurements and qualitative evaluated fibular incisura morphology. Tang ratios for fibular rotation, anterior and posterior tibiofibular distances, fibular incisura depth, and subjective morphologies on CT were assessed using conventional multiplanar reconstruction (MPR) and maximum-intensity projections (MIPs). On conventional CT, the mean Tang ratio was 0.97 ± 0.06; the mean anterior tibiofibular distance was 2.17 ± 0.87 mm; the mean posterior tibiofibular distance was 3.52 ± 0.94 mm; and the mean depth of fibular incisura was 3.29 ± 1.19 mm. Five morphologic variations of the fibular incisura were identified: crescentic, trapezoid, flat, chevron, and widow's peak. The most common fibular incisura morphology was crescentic (61.3%), followed by trapezoid shape (25.1%); the least common morphology was flat (3.1%). Interobserver variability with intraclass correlation coefficient (ICC) was slightly higher for all quantitative measures on MPR (ICC = 0.72 to .81) versus MIP (ICC = 0.64 to 0.75). ICC for incisura shape and depth assessments was poor on both modalities (0.13 to 0.38). This comprehensive CT study reports on quantitative and qualitative descriptive measures to evaluate fibular incisura morphologies and fibular orientation. It also defines the frequency of DTFS measures and the interobserver performance on 2 CT evaluation methods.

Increased Rates of Readmission, Reoperation, and Mortality Following Open Reduction and Internal Fixation of Ankle Fractures Are Associated With Diabetes Mellitus

J Foot Ankle Surg. 2019 Feb 11. pii: S1067-2516(18)30427-7. doi: 10.1053/j.jfas.2018.09.023. [Epub ahead of print]
Liu JW, Ahn J, **Raspovic KM, Liu GT,** Nakonezny PA, **Lavery LA, Wukich DK**

Abstract: The purpose of this study was to compare the rates of readmission, reoperation, and mortality in patients with and without diabetes mellitus during the 30-day postoperative period after ankle fracture surgery. Patients who underwent operative management for ankle fractures between 2006 and 2015 were identified in the American College of Surgeons National Surgical Quality Improvement Program® database by using Current Procedural Terminology codes for ankle fracture surgery. A total of 17,464 patients undergoing ankle fracture surgery were identified. Of these patients, 2044 (11.7%) had diabetes and 15,420 (88.3%) did not have diabetes. We excluded patients older than 90 years or with inadequate perioperative data. Patients with diabetes had significantly higher rates of readmission (2.84% vs. 1.05%, p < .0001), significantly higher rates of unplanned reoperation (2.3% vs. 0.74%, p < .0001), and significantly higher rates of mortality (0.7% vs. 0.2%, p < .0001) compared with patients without diabetes. Additionally, patients with diabetes had significantly greater age-adjusted odds ratios (ORs) of unplanned readmission (OR 2.40, 95% confidence interval [CI] 1.74 to 3.31, p < .0001), unplanned reoperation (OR 2.56, 95% CI 1.44 to 3.27, p < .0001), and mortality (OR 2.01, 95% CI 1.08 to 3.62, p = .0432) than did patients without diabetes after ankle surgery. In this large-scale retrospective study, we demonstrated that the presence of diabetes significantly increases the risk of unplanned readmission, unplanned reoperation, and mortality during the 30-day postoperative period after ankle fracture surgery.

Criteria for Surgical Reduction in High-Grade Lumbosacral Spondylolisthesis Based on Quality of Life Measures

Eur Spine J. 2019 Mar 26. doi: 10.1007/s00586-019-05954-x. [Epub ahead of print]
Mac-Thiong JM, Hresko MT, Alzakri A, Parent S, **Sucato DJ,** Lenke LG, Marks M, Labelle H

Purpose: Although surgical reduction in high-grade lumbosacral spondylolisthesis is often performed in young patients, criteria for defining adequate reduction leading to optimal outcomes have yet to be

defined. The purpose of this study is to determine if surgical reduction in pelvic balance, slip grade, lumbosacral angle, and L5 incidence are associated with quality of life after surgery, based on specific criteria proposed previously in the literature.

Methods: A prospective cohort of 61 patients (14.4 ± 2.7 years) with high-grade lumbosacral spondylolisthesis was followed for a minimum of 2 years after surgery. SRS-22 scores, slip grade, lumbosacral angle, pelvic balance, and L5 incidence were assessed before surgery and at the latest follow-up. Multivariable regression analyses were performed using postoperative SRS domain and total scores as the dependent variables. Independent variables consisted of the preoperative SRS scores, and specific criteria of pelvic balance, slip grade, lumbosacral angle, and L5 incidence. The influence of slip grade, lumbosacral angle, and L5 incidence on pelvic balance was also assessed.

Results: Obtaining a balanced pelvis postoperatively was mainly predictive of improved satisfaction with surgery and self-image and also tended to be associated with higher scores for other domains. Improved mental health was associated with reduction to a low-grade slip. Reduction in lumbosacral angle was not predictive of quality of life. Postoperative pelvic balance was mainly associated with preoperative pelvic balance, but there was a tendency for achieving normal pelvic balance when the postoperative L5 incidence was 60° or smaller.

Conclusions: When performing surgery in young patients with high-grade lumbosacral spondylolisthesis, achieving normal pelvic balance is the key because it is associated with improved quality of life. Reduction to a low-grade slip is predictive of improved mental health, but reduction in lumbosacral angle is not associated with postoperative quality of life. There was a tendency for obtaining normal postoperative balance in patients with postoperative L5 incidence 60° or smaller. These slides can be retrieved under Electronic Supplementary Material.

Achilles Pain, Stiffness, and Muscle Power Deficits: Midportion Achilles Tendinopathy Revision 2018

J Orthop Sports Phys Ther. 2018 May;48(5):A1-A38. doi: 10.2519/jospt.2018.0302.
Martin RL, Chimenti R, Cuddeford T, Houck J, Matheson JW, McDonough CM, Paulseth S, **Wukich DK,** Carcia CR

Abstract: The Orthopaedic Section of the American Physical Therapy Association (APTA) has an ongoing effort to create evidence-based practice guidelines for orthopaedic physical therapy management of patients with musculoskeletal impairments described in the World Health Organization's International Classification of Functioning, Disability, and Health (ICF). The purpose of these revised clinical practice guidelines is to review recent peer-reviewed literature and make recommendations related to midportion Achilles tendinopathy.

Is Anteromedial Drilling Safe in Transphyseal Anterior Cruciate Ligament Reconstruction in Adolescents With Growth Remaining?

J Pediatr Orthop. 2019 Apr;39(4):e278-e283. doi: 10.1097/BPO.0000000000001289.
Mathew S, **Ellis HB,** Wyatt CW, Sabatino MJ, Zynda AJ, Dennis G, **Wilson PL**

Background: Previous reports of transphyseal drilling in anterior cruciate ligament (ACL) reconstruction have demonstrated good clinical outcomes without subjective changes in further skeletal development. The purpose of this study is to evaluate radiographic changes during continued growth following a transphyseal ACL reconstruction using an anteromedial femoral (AM) drilling technique in patients with > 18 months of growth remaining.

Methods: A review of consecutive adolescents who underwent a soft tissue transphyseal ACL reconstruction using an AM drilling technique was performed. Inclusion criteria was 18 months of growth remaining based on radiographic bone age and standing radiographs at least one year from the index procedure. Demographic, preoperative, and postoperative data, and follow-up three-foot standing lower extremity radiographs were reviewed. Radiographic data included femoral length, tibial length, total lower extremity length, mechanical axis deviation (MAD), lateral distal femoral angle (LDFA), and medial proximal tibial angle (MPTA).

Results: In total 12 adolescent patients with a mean age of 13.4 years (range, 12.3 to 14.4) and bone age of 13.4 years (11.5 to 14) at the time of surgery were included. At an average of 2.27-year follow-up (412 to 1058 d), there was no difference in the total growth of the operative and nonoperative limb (48.5 mm vs. 47 mm; P = 0.36). In addition, the average increases in femoral length (23.4 mm) and tibial length (25.8 mm) were not statistically different between the operative and the nonoperative limb (P = 0.12; P = 0.75). There was no statistical difference in mechanical axis deviation, LDFA, or MPTA between preoperative and postoperative radiographs. Mean differences in operative and nonoperative coronal angular changes were all < 1.5 degrees.

Conclusions: With at least 2 years of growth remaining, transphyseal ACL reconstruction with anteromedial drilling did not significantly affect the physis or residual growth compared with the contralateral extremity. Although this technique may create a larger defect in the physis, standing radiographs demonstrate there is no change in limb length or angulation in growing adolescents approximately 2 years after surgery.

Complications of Biceps Tenodesis Based on Location, Fixation, and Indication: A Review of 1,526 Shoulders

J Shoulder Elbow Surg. 2019 Mar;28(3):461-469. doi: 10.1016/j.jse.2018.09.005. Epub 2018 Dec 18.
McCrum CL, Alluri RK, Batech M, Mirzayan R

Background: Long head of the biceps tendon (LHBT) tenodesis is predominantly performed for 2 reasons: anterior shoulder pain (ASP) or structural reasons (partial tear, dislocation).

Methods: Between 2006 and 2014, all cases of primary LHBT tenodesis performed at an integrated health care system were retrospectively reviewed. Complications were analyzed by tenodesis location (below or out of the groove [OOG] vs. leaving tendon in the groove [ITG]), fixation method (soft tissue vs. implant), and indication (preoperative ASP vs. structural).

Results: Among 1,526 shoulders, persistent ASP did not differ by fixation method (11.0% for implant vs. 12.8% for soft tissue, P = .550) or location (10.8% for OOG vs. 12.9% for ITG, P = .472). Soft-tissue tenodesis cases had more frequent new-onset ASP (11.9% vs. 2.6%, P < .001) and subjective weakness (8.50% vs. 3.92%, P < .001) but less frequent revisions (0% vs. 1.19%, P = .03) than implant tenodesis cases. No difference was found between ITG and OOG for persistent ASP (12.9% vs. 10.8%, P = .550), new-onset ASP (6.5% vs. 2.8%, P = .339), cramping (1.70% vs. 2.31%, P = .737), deformity (4.72% vs. 4.62%, P = .532), or subjective weakness (6.23% vs. 4.32%, P = .334), but ITG cases had more revisions (1.51% vs. 0.60%, P = .001). Among implant tenodesis cases, 1 shoulder (0.085%) sustained a fracture.

Conclusion: The overall complication rate of LHBT tenodesis was low. Of the shoulders, 10.8% to 12.9% continued to have ASP, regardless of whether the LHBT was left ITG. Soft-tissue tenodesis cases had higher rates of new-onset ASP and subjective weakness. No significant difference for tenodesis ITG or OOG was found in biceps-related complications.

Quadratus Lumborum Block Provides Improved Immediate Postoperative Analgesia and Decreased Opioid Use Compared With a Multimodal Pain Regimen Following Hip Arthroscopy

J Hip Preserv Surg. 2018 Oct 25;5(3):233-239. doi: 10.1093/jhps/hny024. eCollection 2018 Aug.
McCrum CL, Ben-David B, Shin JJ, Wright VJ

Abstract: The purpose of our study was to evaluate the effect on immediate patient outcomes following hip arthroscopy with use of a preoperative, single-shot quadratus lumborum (QL) block. We retrospectively reviewed patients who underwent hip arthroscopy following a preoperative QL block. These patients were matched by age and gender to patients who had not received a block. Visual analogue scale (VAS) pain scores immediately postoperatively and at the time of discharge were recorded. Hourly and overall opioid intake in the postanesthesia care unit (PACU) was also recorded. Continuous data was analyzed with paired t-test, with significance being defined as $P < 0.05$. Complications in the immediate postoperative period were recorded, as was time from admission to PACU to discharge. Fifty-six patients were included. Twenty-eight patients underwent QL block, and 28 did not undergo a block. QL block patients required significantly less hydromorphone ($P = 0.010$) and oxycodone ($P = 0.001$) during their time in the PACU, and significantly fewer morphine equivalents overall and per hour in the PACU ($P < 0.001$). Despite receiving less opioid analgesia, QL block patients had significantly less pain immediately postoperatively ($P = 0.026$) and at the time of discharge ($P = 0.015$). The mean time to PACU discharge was 155 ± 49 min, and there was no difference in time to discharge between groups ($P = 0.295$). One patient in the QL block group experienced persistent flank numbness. Hip arthroscopy patients who received a preoperative QL block had less pain and a lower opioid requirement in PACU than those who did not receive a block.

Return to Play After PRP and Rehabilitation of 3 Elite Ice Hockey Players With Ulnar Collateral Ligament Injuries of the Elbow

Orthop J Sports Med. 2018 Aug17;6(8):2325967118790760. doi: 10.1177/2325967118790760. eCollection 2018 Aug.
McCrum CL, Costello J, Onishi K, Stewart C, Vyas D

Background: Ulnar collateral ligament (UCL) injury is a well-described etiology of pain and decreased performance for the overhead athlete. Despite a growing volume of literature regarding the treatment of these injuries for overhead athletes, there is a paucity of such data regarding stickhandling collision sport athletes, such as ice hockey players.

Purpose/Hypothesis: The purpose of this study was to characterize this injury among 3 elite ice hockey players and to describe the ability of these athletes to return to play, as well as to review the unique sport-specific implications of this injury, evaluation, nonsurgical management, and considerations for return to play. The authors hypothesized that elite ice hockey players will be able to return to play at the same level following nonoperative treatment of UCL injury.

Study Design: Case series; level of evidence, 4.

Methods: Data from 3 elite professional ice hockey players who sustained a high-grade injury to the UCL were retrospectively reviewed. All athletes underwent 2 autologous conditioned plasma injections as part of their treatment and were evaluated with ultrasonography and magnetic resonance imaging.

Results: Three consecutive elite ice hockey players were included in this study, and no patients were excluded. Players were cleared to full return to play at a mean 36 days post-injury. Follow-up examination at this time point demonstrated full range of motion of the elbow for all athletes, without tenderness to palpation over the UCL, including no tenderness over the humeral insertion site. Stability examination improved as well, demonstrating a soft-to-moderate endpoint with valgus stress, although this was not symmetric to the contralateral side. All athletes were able to continue to play at the same level of competition as before the injury occurred, without any complaints. No players had repeat injury during the same or following seasons.

Conclusion: The authors present 3 elite-level ice hockey players who sustained a high-grade injury to the UCL. Successful return to play was possible after nonoperative treatment with injection of autologous conditioned plasma at a mean 36 days following injury. Athletes who injure either the top or bottom hand can return to play at the same elite level following this injury.

Motocross Injuries in Pediatric and Adolescent Patients

J Am Acad Orthop Surg. 2018 Mar 1;26(5):162-165. doi: 10.5435/JAAOS-D-16-00405.
McIntosh AL, Christophersen CM

Abstract: Motocross is a popular sport in which participants ride a two-wheeled, motorized vehicle on an uneven 2-km track with natural or human-made obstacles. Participants compete at high rates of speed, and children as young as age 4 years compete in age-appropriate groups. Motocross is recognized as a strenuous sport with a high accident rate. Most injuries are musculoskeletal in nature. The most commonly injured areas are the forearm, clavicle, femur, and tibia. Many injuries require surgical treatment. Some patients sustain head trauma with loss of consciousness. Children should have age-appropriate training before participation is allowed. Adult supervision should occur at all times. Appropriate helmet fitting with assistance from an expert is associated with a decreased risk of concussion symptoms. Parents and coaches need to weigh the benefits of participation with the frequency of injuries, missed academic time, and the cost of medical treatment.

Ionic Silicon Improves Endothelial Cells' Survival Under Toxic Oxidative Stress by Overexpressing Angiogenic Markers and Antioxidant Enzymes

J Tissue Eng Regen Med. 2018 Nov;12(11):2203-2220. doi: 10.1002/term.2744. Epub 2018 Oct 24.
Monte F, Cebe T, Ripperger D, Ighani F, Kojouharov HV, Chen BM, **Kim HKW,** Aswath PB, Varanasi VG

Abstract: Oxidative stress, induced by harmful levels of reactive oxygen species, is a common occurrence that impairs proper bone defect vascular healing through the impairment of endothelial cell function. Ionic silicon released from silica-based biomaterials can upregulate hypoxia-inducible factor-1α (HIF-1α). Yet it is unclear whether ionic Si can restore endothelial cell function under oxidative stress conditions. Therefore, we hypothesized that ionic silicon can help improve human umbilical vein endothelial cells' (HUVECs') survival under toxic oxidative stress. In this study, we evaluated the ionic silicon effect on HUVECs' viability, proliferation, migration, gene expression, and capillary tube formation under normal conditions and under harmful hydrogen peroxide levels. We demonstrated that 0.5-mM Si4+ significantly enhanced angiogenesis in HUVECs under normal conditions ($p < 0.05$). HUVECs exposed to 0.5-mM Si4+ presented a morphological change, even without the bed of Matrigel, and formed significantly more tube-like structures than the control ($p < 0.001$). In addition, 0.5-mM Si4+ enhanced cell viability in HUVECs under harmful H_2O_2 levels. HIF-1α, vascular endothelial growth factor-A, and vascular endothelial growth factor receptor-2 were overexpressed more than twofold in silicon-treated HUVECs, under normal and toxic H_2O_2 conditions. Moreover, the HUVECs were treated with 0.5-mM Si4+ overexpressed superoxide dismutase-1 (SOD-1), catalase-1 (Cat-1), and nitric oxide synthase-3 (NOS3) under normal and oxidative stress environments ($p < 0.01$). A computational model was used for explaining the antioxidant effect of Si4+ in endothelial cells and human periosteum cells by SOD-1 enhancement. In conclusion, we demonstrated that 0.5-mM Si4+ can recover the HUVECs' viability under oxidative stress conditions by reducing cell death and upregulating expression of angiogenic and antioxidant factors.

Continuous Diffusion of Oxygen Improves Diabetic Foot Ulcer Healing When Compared With a Placebo Control: A Randomised, Double-Blind, Multicentre Study

J Wound Care. 2018 Sep 1;27(Sup9):S30-S45. doi: 10.12968/jowc.2018.27.Sup9.S30.
Niederauer MQ, Michalek JE, Liu Q, Papas KK, **Lavery LA,** Armstrong DG

Objective: The aim of this study was to assess whether continuous diffusion of oxygen improves healing in people receiving treatment for diabetic foot ulcers (DFU).

Method: A double-blind, placebo-controlled, randomized study to receive either active continuous diffusion of oxygen (CDO) therapy using an active CDO device, or a fully operational placebo device without delivering oxygen. Patients were followed until closure or 12 weeks. Patients, caretakers, treating physicians, and independent evaluators were blinded to the study arm. All patients received identical offloading, debridement, dressings, and follow-up.

Results: We enrolled 146 people with DFUs (77% male, aged 56.3 ± 12.4 years). A significantly higher proportion (195%) of DFUs healed in the CDO arm compared with placebo (32.4% versus 16.7%, p = 0.033). The time to 50% DFU closure was significantly shorter in patients who received CDO therapy (mean 18.4 versus 28.9 days, p = 0.001). There were no differences in overall adverse events (p = 0.66) or ulcer-related adverse events (p = 0.30) in the active and placebo treatment groups. The relative performance of active CDO over placebo became greater when used in larger wounds (273%), in more chronic wounds (334%), and in weight-bearing wounds (465%).

Conclusion: The results of this study demonstrate that CDO leads to a higher proportion of healed DFUs (p = 0.033) and a faster time to closure compared with placebo in people with DFUs (p = 0.015). Relative performance did not vary significantly with wound size (p = 0.80) but revealed better relative performance in more chronic wounds (p = 0.008) and in weight-bearing wounds (p = 0.003).

An International Meta-Analysis Confirms the Association of BNC2 With Adolescent Idiopathic Scoliosis

Sci Rep. 2018 Mar 16;8(1):4730. doi: 10.1038/s41598-018-22552-x.
Ogura Y, Takeda K, Kou I, Khanshour A, Grauers A, Zhou H, Liu G, Fan YH, Zhou T, Wu Z, Takahashi Y, Matsumoto M, Japan Scoliosis Clinical Research Group (JSCRG), **Texas Scottish Rite Hospital for Children Clinical Group (TSRHCCG),** Einarsdottir E, Kere J, Huang D, Qiu G, Xu L, Qiu Y, **Wise CA,** Song YQ, Wu N, Su P, Gerdhem P, Watanabe K, Ikegawa S

Abstract: Adolescent idiopathic scoliosis (AIS) is a common spinal deformity with the prevalence of approximately 3%. We previously conducted a genome-wide association study (GWAS) using a Japanese cohort and identified a novel locus on chromosome 9p22.2. However, a replication study using multi-population cohorts has not been conducted. To confirm the association of 9p22.2 locus with AIS in multiethnic populations, we conducted an international meta-analysis using eight cohorts. In total, we analyzed 8,756 cases and 27,822 controls. The analysis showed a convincing evidence of association between rs3904778 and AIS. Seven out of eight cohorts had significant P value, and the remaining one cohort also had the same trend as the seven. The combined P was 3.28×10-18 (odds ratio=1.19, 95% confidence interval=1.14-1.24). In silico analyses suggested that *BNC2* is the AIS susceptibility gene in this locus.

Adolescent Clavicle Nonunions: Potential Risk Factors and Surgical Management

J Shoulder Elbow Surg. 2018 Jan;27(1):29-35. doi: 10.1016/j.jse.2017.06.040. Epub 2017 Aug 24.
Pennock AT, Edmonds EW, Bae DS, Kocher MS, Li Y, Farley FA, **Ellis HB, Wilson PL,** Nepple J, Gordon JE, Willimon SC, Busch MT, Spence DD, Kelly DM, Pandya NK, Sabatini CS, Shea KG, Heyworth BE

Background: Clavicle nonunions in adolescent patients are exceedingly rare. The purpose of this study was to evaluate a series of clavicle nonunions from a pediatric multicenter study group to assess potential risk factors and treatment outcomes.

Methods: A retrospective review of all clavicle nonunions in patients younger than 19 years was performed at 9 pediatric hospitals between 2006 and 2016. Demographic and surgical data were documented. Radiographs were evaluated for initial fracture classification, displacement, shortening, angulation, and nonunion type. Clinical outcomes were evaluated, including rate of healing, time to union, return to sports, and complications. Risk factors for nonunion were assessed by comparing the study cohort with a separate cohort of age-matched patients with a diaphyseal clavicle fracture.

Results: There were 25 nonunions (mean age, 14.5 years; range, 10.0-18.9 years) identified, all of which underwent surgical fixation. Most fractures were completely displaced (68%) initially, but 21% were partially displaced and 11% were nondisplaced. Bone grafting was performed in 24 of 25 cases, typically using the hypertrophic callus. Radiographic healing was achieved in 96% of cases. One patient (4%) required 2 additional procedures to achieve union. The primary risk factor for development of a nonunion was a previous history of an ipsilateral clavicle fracture.

Conclusions: Clavicle nonunions can occur in the adolescent population but are an uncommon clinical entity. The majority occur in male patients with displaced fractures, many of whom have sustained previous fractures of the same clavicle. High rates of union were achieved with plate fixation and the use of bone graft.

What Are the Indications for Spinal Fusion Surgery in Scheuermann Kyphosis?

J Pediatr Orthop. 2019 May/Jun;39(5):217-221. doi: 10.1097/BPO.0000000000000931.
Polly DW Jr, Ledonio CGT, Diamond B, Labelle H, **Sucato DJ,** Hresko MT, Emans JB, Vitale MG, Erickson MA, Larson AN; Spinal Deformity Study Group

Background: Surgical indications for Scheuermann kyphosis are variable. We sought to evaluate the characteristics of patients undergoing operative versus nonoperative treatment of Scheuermann kyphosis to better understand current practices and the factors which contribute to the decision for surgical management.

Methods: Multicenter prospective cohort study. We evaluated consecutive patients presenting with Scheuermann kyphosis. Patients underwent either surgical or nonoperative management according to surgeon and patient discretion. Preoperative patient-reported outcome measures (Scoliosis Research Society and Spinal Appearance Questionnaire scores), demographics, and radiographic characteristics were assessed.

Results: Overall, 150 patients with Scheuermann kyphosis were enrolled, with 77 choosing nonoperative treatment and 73 treated operatively. Compared with the nonoperative cohort, patients treated operatively were older (16.3 ± 2.0 vs. 15.1 ± 2.2, P = 0.0004), and had higher body mass index (26.3 ± 7.2 vs. 22.7 ± 6.5, P = 0.003), had greater T2-T12 kyphosis (71 ± 14 degrees vs. 61 ± 12 degrees, P < 0.001), increased pelvic incidence (46 vs. 41 degrees, P = 0.03) and pelvic tilt (10 vs. 3 degrees, P = 0.03). There was no detected difference in maximal sagittal Cobb angle in the operative versus nonoperative patients (73 ± 11 vs. 70 ± 12 degrees, P = 0.11). Functionally, the operative patients had worse Scoliosis Research Society pain scores (3.7 ± 0.9 vs. 4.1 ± 0.7, P = 0.0027) and appearance scores (2.9 ± 0.7 vs. 3.4 ± 0.8, P < 0.0001).

Conclusions: Patients undergoing surgical management of Scheuermann disease were more likely to have large body mass index and worse pain scores. Other factors beyond radiographic measurement likely contribute to the decision for surgical management of Scheuermann kyphosis.

A New Radiographic Classification System for Developmental Hip Dysplasia Is Reliable and Predictive of Successful Closed Reduction and Late Pelvic Osteotomy

J Pediatr Orthop. 2018 Jan;38(1):16-21. doi: 10.1097/BPO.0000000000000733.
Ramo BA, De La Rocha A, **Sucato DJ, Jo CH**

Background: The Tonnis radiographic classification of developmental dysplasia of the hip (DDH) has been used as a prognostic indicator for patients with walking-age DDH. The International Hip Dysplasia Institute (IHDI) classification, a new radiographic classification system, has been proposed to be more reliable by its creators. We sought to validate its reliability using independent observers, to compare it to the Tonnis method, and to assess its prognostic significance in a large cohort of patients.

Methods: A consecutive series of walking-age DDH patients were examined radiographically and classified by the Tonnis and IHDI schemes by 3 independent observers. Interobserver agreement was determined using the Kappa method. Clinical data were collected on patients with regard to success of closed reduction, need for later pelvic osteotomy, and presence of subsequent radiographic avascular necrosis (AVN). The prognostic value of the Tonnis and IHDI classifications to predict these clinical outcomes was determined.

Results: A total of 287 hips were available for analysis of the classification schemes. In total, 235 hips underwent attempted closed reduction and were eligible for analysis of successful closed reduction, and 131 hips had > 4-year follow-up and were utilized for analysis of late pelvic osteotomy and AVN. Both classifications showed excellent interobserver reliability and, in general, there was nonstatistically significant better reliability for the IHDI versus the Tonnis classification. In multivariate analysis, both IHDI and Tonnis classifications were found to be predictive of successful closed reduction and need for late pelvic osteotomy. Both methods showed trends toward being predictive of AVN rate, without statistical significance.

Conclusions: The IHDI classification is subjectively more facile to use and has excellent interrelater agreement for classifying the radiographic severity of DDH. It is also reliable in predicting success of closed reduction and need for late pelvic osteotomy.

Significance: Practitioners and researchers should consider the IHDI classification as a useful classification scheme and prognosticator when considering treatment options for late-presenting DDH.

Effectiveness of Viable Cryopreserved Placental Membranes for Management of Diabetic Foot Ulcers in a Real-World Setting

Wound Repair Regen. 2018 Mar;26(2):213-220. doi: 10.1111/wrr.12635. Epub 2018 May 23.
Raspovic KM, Wukich DK, Naiman DQ, **Lavery LA,** Kirsner RS, Kim PJ, Steinberg JS, Attinger CE, Danilkovitch A

Abstract: In a multicenter randomized controlled trial (RCT), the use of viable cryopreserved placental membrane (vCPM) for chronic diabetic foot ulcers (DFUs) resulted in a higher proportion of wound closure in comparison to good wound care: 62% versus 21% ($p < 0.01$). However, patients in RCTs are not representative of daily physician practice. Health care databases serve as a valuable tool to evaluate therapy effectiveness and to supplement evidence from RCTs. The objective of this study was to evaluate the effectiveness of vCPM for DFU management using Net Health's WoundExpert® electronic health records (EHR). The primary endpoint was the proportion of DFUs that achieved complete closure. Other endpoints included time and number of grafts to closure, probability of wound closure by week 12, and the number of wound-related infections and amputations. De-identified EHR data for 360 patients with 441 wounds treated with vCPM were extracted from the database. Average patient age was 63.7 years with a mean wound size of 5.1 cm^2 and an average wound duration of 102 days prior to vCPM treatment. For evaluation of clinical outcomes, 350 DFUs larger than 0.25 cm^2 at baseline were analyzed. Closure at the end of treatment was achieved in 59.4% of wounds with a median treatment duration of 42.0 days and 4 applications of vCPM. The probability of wound closure at week 12 was 71%, and the number of amputations and wound-related infections was 13 (3.0%) and 9 (2.0%), respectively. Data also demonstrated a correlation between wound size and closure rate as well as a correlation between > 50% wound area reduction by week 4 and wound closure by week 12. The results of this study mirror previous RCT efficacy data, supporting the benefits of vCPM for DFU management. These results can also influence policy and treatment decisions regarding advanced vCPM technology.

Functional Outcomes Following Operative Treatment of Tibial Tubercle Fractures

J Pediatr Orthop. 2019 Feb;39(2):e108-e113. doi: 10.1097/BPO.0000000000001087.
Riccio AI, Tulchin-Francis K, Hogue GD, **Wimberly RL, Gill CS,** Collins D, **Karol LA**

Background: Quantitative evaluation of the functional results of surgically managed tibial tubercle fractures in adolescents is unreported in the orthopaedic literature.

Methods: All patients treated surgically for unilateral tibial tubercle fractures at a single institution from 2007 to 2011 were invited to return for functional evaluation. Fractures were classified using the Ogden classification system. Clinical examination at follow-up included passive knee range of motion and thigh circumference. Side-to-side knee extension strength deficits were evaluated using a Biodex dynamometer. Patient-reported outcomes were assessed using the Pediatric-International Knee Documentation Committee Subjective Knee Form (Pedi-IKDC), Tegner-Lysholm Knee Scoring Scale, and Visual Analog Pain Scale. Chart review was performed to determine postoperative protocols including the use of physical therapy and protected weight bearing. Functional parameters were compared between the involved and uninvolved extremities using the Wilcoxon Signed Ranks Test, and the Spearman correlations were performed to identify any relationships between perioperative factors, functional parameters, and subjective outcomes.

Results: In total, 19 of 42 patients completed clinical and functional testing and 18 of 19 completed all outcome surveys. Average age at injury was 13.9 years, and average follow-up was 3.0 years. There was no statistical difference in knee range of motion between sides; however, thigh circumference was slightly smaller in the injured extremity (median difference, 1.7 cm at 15 cm above the patella and 4.0 cm at 50% of the length of the thigh). In total, 5/19 subjects (26%) had a significant quadriceps extension strength deficit on the involved leg compared with the contralateral side. The median Visual Analog Pain Scale for affected limbs was 8/100 and for unaffected limbs was 6/100 ($P = 0.017$). The Tegner-Lysholm Scale revealed 9 excellent results, 5 good, 4 fair, and 1 poor (median, 90/100). Results of the Pedi-IKDC were 11 excellent, 3 good, 2 fair, and 3 poor results (median, 91/100). Outcome scores did not correlate to diminished strength or thigh circumference. No difference in outcome based upon body mass index, postoperative weight-bearing status, Ogden classification, or postoperative physical therapy was noted using regression analysis.

Conclusions: Despite promising objective results, clinical outcomes measured by subjective validated surveys are not all excellent.

Perioperative Interdisciplinary Intervention Contributes to Improved Outcomes of Adolescents Treated With Hip Preservation Surgery

J Pediatr Orthop. 2018 May/Jun;38(5):254-259. doi: 10.1097/BPO.0000000000000816.
Richard HM, Nguyen DC, **Podeszwa DA,** De La Rocha A, **Sucato DJ**

Background: Adolescent hip preservation surgery (HPS) candidates typically present with chronic pain, which can negatively affect psychological function and surgical outcomes. A previous study demonstrated high rates of psychological symptoms and maladaptive behaviors in this population. This study quantified psychological and functional improvements in these patients from preoperative presentation to postoperative follow-up. An integrated interdisciplinary approach is also described.

Methods: A total of 67 patients undergoing HPS were evaluated preoperatively and postoperatively at 1 year by staff psychologists. Perioperative psychological intervention consisted of education, counseling, and administration of self-report measures. Self-report measure scores were compared preoperatively and postoperatively, grouped by orthopaedic diagnoses. Frequency analysis, correlational analysis, and analysis of variance were conducted.

Results: Psychological function improved significantly at follow-up: decreased emotional symptomatology (46.1 to 43.6, P = 0.013), anxiety (49.6 to 45.8, P < 0.001), school problems (46.6 to 44.7, P = 0.035), internalizing problems (46.3 to 44.1, P = 0.015), social stress (44.5 to 42.3, P = 0.024), sense of inadequacy (49.0 to 46.0, P = 0.004), and increased self-concept (51.1 to 54.1, P = 0.003). Resiliency factors also significantly improved: increased mastery (50.3 to 52.9, P = 0.001) and resourcefulness (49.7 to 52.0, P = 0.046), decreased emotional reactivity (46.3 to 42.9, P = 0.001), and vulnerability (47.7 to 44.7, P = 0.011). Physical function and return to activity also significantly improved (University of California, Los Angeles: 7.1 to 8.7, P = 0.017; modified Harris Hip Score: 67.3 to 83.8, P < 0.001). Return to activity positively correlated with optimism and self-efficacy (P = 0.041). Femoroacetabular impingement and hip dysplasia patients consistently reported feeling less depressed (P = 0.036), having fewer somatic complaints (P = 0.023), fewer internalized problems (P = 0.037), and exhibiting fewer atypical behaviors (P = 0.036) at follow-up. Slipped capital femoral epiphysis patients did not demonstrate improvements in psychological functioning postoperatively.

Conclusions: Perioperative psychological education and counseling, in combination with HPS, improved postoperative psychological and physical function. Patients reported reduced anxiety, school problems, and social stress, with marked increase in resilience. Increased mobility and return to activity significantly correlated with improved optimism and self-efficacy.

Long-Term Outcomes of Operative and Nonoperative Treatment of Congenital Coxa Vara

J Pediatr Orthop. 2018 Apr;38(4):193-201. doi: 10.1097/BPO.0000000000000782.
Roberts DW, Saglam Y, De La Rocha A, Frasquillo BN, Tulchin-Francis K, **Kim HKW**

Background: Congenital coxa vara (CCV) is a rare hip condition with few long-term studies. The purpose of this study was to assess clinical, radiographic, and functional outcomes after operative and nonoperative treatment of CCV, assess reliability of radiographic parameters, and investigate risk factors for recurrence after surgery.

Methods: Retrospective review was performed of all CCV patients treated at 1 institution from 1980 to 2010. In addition, patients were recalled for additional follow-up X-rays, modified Harris Hip Score (mHHS), and gait analysis. Radiographic measurements [neck-shaft angle (NSA), head-shaft angle (HSA), Hilgenreiner-epiphyseal angle (HEA), and femoral neck length (FNL)] were assessed for reliability using intraclass correlation coefficients. Multivariate analysis was performed to identify risk factors for recurrence after surgery.

Results: Forty-six hips in 32 patients were reviewed. Mean age at presentation was 5.4 ± 4.9 years. Mean follow-up was 11.8 ± 5.8 years. Valgus proximal femoral osteotomy was performed in 27 hips (20 patients). Initial deformity was greater in the operative group (NSA 90 ± 17 degrees, HEA 68 ± 19 degrees) versus nonoperative patients (NSA 122 ± 19 degrees, HEA 34 ± 14 degrees) (P < 0.0001), but radiographic outcomes were similar at follow-up. Most nonoperative hips had normal FNL growth rates (80%), but resolution of varus NSA occurred in only 21%. In contrast, 56% of operative hips showed decreased FNL growth rates. Interobserver reliability was excellent for HEA (0.98), NSA (0.90), and FNL (0.89), and good for HSA (0.79). Repeat osteotomy was performed in 6 cases (22%). No significant predictors for recurrence were identified. At long-term follow-up for recalled patients, 72% had significantly abnormal gait, and 50% had fair-poor functional outcomes (mHHS < 79).

Conclusions: Valgus osteotomy corrects severe deformity in CCV with improved clinical and radiographic outcomes. HEA and NSA are the most reliable radiographic measurements of proximal femoral deformity in CCV. Recurrence is not uncommon, but no predictors were identified. Many patients have persistent gait abnormalities and functional impairment at long-term follow-up, regardless of prior treatment.

Diagnostic Utility of Erythrocyte Sedimentation Rate and C-Reactive Protein in Osteomyelitis of the Foot in Persons Without Diabetes

J Foot Ankle Surg. 2019 Jan 23. pii: S1067-2516(18)30429-0. doi: 10.1053/j.jfas.2018.09.025. [Epub ahead of print]
Ryan EC, Ahn J, **Wukich DK,** Kim PJ, **La Fontaine J, Lavery LA**

Abstract: The aim of the study was to assess the diagnostic value of erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) levels in differentiating foot osteomyelitis (OM) from soft tissue infection (STI) in persons without diabetes. We evaluated 102 patients in a retrospective cohort study of nondiabetic patients admitted to our institution with OM (n = 51) and with STI (n = 51). Patient diagnosis was determined through bone culture and/or histopathology for OM and magnetic resonance scan and/or single-photon emission computed tomography for STI. Cutoffs for ESR and CRP to predict OM as identified by receiver operating characteristic were 45.5 mm/h and 3.45 mg/dL, respectively. The ESR cutoff demonstrated a sensitivity and specificity of 49% and 79%, while the values for CRP were 45% and 71%, respectively. The combined sensitivity and specificity for ESR and CRP were 33% and 84%. The positive and negative predictive values were 68% and 60% for ESR and 61% and 56% for CRP, respectively. In conclusion, ESR and CRP demonstrate poor sensitivity and specificity for detecting OM in the nondiabetic foot. These markers have little diagnostic utility in the nondiabetic foot.

Biomechanical Considerations in Foot and Ankle Circular External Fixation: Maintenance of Wire Tension

Clin Podiatr Med Surg. 2018 Oct;35(4):443-455. doi: 10.1016/j.cpm.2018.05.004. Epub 2018 Aug 11.
Samchukov ML, Clifford CE, McCann KM, **Cherkashin AM,** Hutchinson B, Pierce WA

Abstract: Initial tensioning of the forefoot wires to 130 kg followed by simultaneous tensioning of the calcaneal wires to 90 kg and using the rigid double-row foot plate closed anteriorly via threaded rods produce maximum preservation of the initial wire tension during foot circular external fixation.

Treatment of Pediatric Osteoid Osteomas Not Amenable to Radiofrequency Ablation: A Retrospective Review of Surgical Outcomes

J Surg Orthop Adv. 2018 Winter;27(4):299-302.
Sanders T, Wenger DE, Ashraf A, **McIntosh AL,** Stans AA, Shaughnessy WJ, van Wijnen AJ, Larson AN

Abstract: The purpose of this study is to describe the surgical treatment of osteoid osteomas in a pediatric cohort of patients who were found not to be candidates for percutaneous ablative therapies. Medical records for 29 pediatric patients who were treated surgically for osteoid osteomas were reviewed. Reasons for surgical management included diagnostic uncertainty or lesions that were in close proximity to an articular surface or neurovascular structure. Twenty-eight patients experienced complete symptom resolution. Surgical treatment may still be indicated in a select group of osteoid osteoma patients who are not candidates for percutaneous treatment.

Analysis of Femoral Version in Patients Undergoing Periacetabular Osteotomy for Symptomatic Acetabular Dysplasia

J Am Acad Orthop Surg. 2018 Aug 1;26(15):545-551. doi: 10.5435/JAAOS-D-17-00076.
Sankar WN, Novais E, Koueiter D, Refakis C, Sink E, Millis MB, Kim YJ, Clohisy J, **Wells J,** Nepple J, Zaltz I

Introduction: A paucity of information exists on the range of femoral version, its effect on hip stability, clinical examination, and presentation in patients with symptomatic acetabular dysplasia. The purpose of this study was to describe the range of version in symptomatic acetabular dysplasia, the association between femoral version and proximal femoral morphology and degree of dysplasia, and the effect of version on clinically measured hip range of motion and on preoperatively measured hip outcome scores.

Methods: We reviewed 314 patients prospectively enrolled in a longitudinal clinical study on periacetabular osteotomy between January 2014 and August 2015 and measured femoral version, morphologic characteristics of the upper femur and acetabulum, and preoperative clinical outcome scores.

Results: The average femoral version was 19.7° ± 11.2° (range, -20° to 50°). Femoral version correlated strongly with clinically measured hip range of motion but did not correlate linearly with either radiographic severity of acetabular dysplasia or preoperative symptomatology.

Discussion: Despite concerns that transverse plane femoral anatomy influences the stability of the hip joint after skeletal maturity, we did not find a statistical association between femoral version and severity of dysplasia or presenting symptomatology. This finding suggests that femoral version is not a major influence on the clinical presentation of acetabular dysplasia.

Subacromial Impingement Anatomy and Its Association With Rotator Cuff Pathology in Women: Radiograph and MRI Correlation, a Retrospective Evaluation

Skeletal Radiol. 2018 Oct 27. doi: 10.1007/s00256-018-3096-0. [Epub ahead of print]
Sasiponganan C, Dessouky R, Ashikyan O, Pezeshk P, **McCrum C,** Xi Y, **Chhabra A**

Objective: To evaluate the relationships between acromial anatomy and developmental alterations with rotator cuff tears in female patients and compare these parameters on radiographs and corresponding MRIs along with inter-reader performance.

Materials and Methods: Patient demographics, symptoms, and acromial characteristics on radiograph (acromial index, lateral acromion angle, subacromial space on AP and Y views, acromial anterior and lateral downsloping) and MRI (shape, slope, spur, osteoarthrosis, os acromiale) were recorded. Radiographic and MRI findings were compared and correlated with rotator cuff pathology on MRI. Inter-reader analysis was performed.

Results: A total of 140 MRIs from 137 female patients were included. No significant correlation ($p > 0.05$) existed between acromial parameters and rotator cuff tears, except for a smaller subacromial space on the Y view and spurs correlated with subscapularis tendon tear ($p = 0.02$, $p = 0.04$). The presence of lateral downsloping on MRI correlated with a smaller lateral acromion angle ($p = 0.0002$) and the presence of lateral downsloping on radiography ($p = 0.0015$). Inter-reader agreements were good to excellent (ICC: 0.65-0.89).

Conclusion: Subacromial impingement anatomy characteristics have no significant associations with supraspinatus or infraspinatus tears in symptomatic women. Among different measures, supine MRI can be reliably used to identify lateral downsloping of the acromion.

Orthopaedic Complications of Linear Morphea: Implications for Early Interdisciplinary Care

Pediatr Dermatol. 2018 Jan;35(1):43-46. doi: 10.1111/pde.13336. Epub 2017 Nov 9.
Schoch JJ, Schoch BS, Werthel JD, **McIntosh AL,** Davis DMR

Abstract: Linear morphea of the limb primarily affects children, and extracutaneous manifestations are common. Orthopaedic surgeons are often essential in the care of patients with linear morphea, yet there are few reports outlining specific orthopaedic complications in this population. We sought to improve the understanding of orthopaedic complications in linear morphea of the limb. Between 1999 and 2014, 51 children were evaluated for linear morphea of an extremity. Twenty-six (51%) had documented orthopaedic manifestations. Outcome measures included limb length discrepancy, angular malalignment, limb atrophy, and orthopaedic surgical intervention. Joint contractures were most common, affecting 88% of patients, followed by limb atrophy, angular deformity, and limb length discrepancy; 14% required surgical intervention. Despite the use of systemic immunosuppressive therapy in many patients, approximately half of patients with linear morphea of an extremity have orthopaedic disease. Early orthopaedist involvement is crucial to improve limb alignment and preserve function.

Flexible Intramedullary Nails for Femur Fractures in Pediatric Patients Heavier Than 100 Pounds

J Pediatr Orthop. 2018 Feb;38(2):88-93. doi: 10.1097/BPO.0000000000000775.
Shaha J, Cage JM, Black S, **Wimberly RL,** Shaha SH, **Riccio AI**

Background: Flexible intramedullary nailing (FIMN) of femoral shaft fractures in children > 100 pounds remains controversial. The purpose of this study is to assess the relationship between patient weight and alignment at radiographic union following Ender's FIMN of pediatric femoral shaft fractures.

Methods: An IRB approved, retrospective review of all patients who sustained a femoral shaft fracture treated by retrograde, stainless-steel Ender's FIMN was performed at a level 1 pediatric trauma center from 2005 to 2012. Preoperative radiographs were analyzed to determine fracture pattern, location, and isthmic canal diameter. Patient weight was measured on presentation to the emergency room. Radiographs at bony union were reviewed to measure shortening, coronal angulation, and sagittal angulation.

Results: A total of 261 children underwent Ender's FIMN for femoral shaft fractures during the study period. There were 24 patients who weighed ≥ 100 lbs. and 237 patients who weighed < 100 lbs. There were no significant differences in sex (75% vs. 73% male), fracture stability (42.6% vs. 41.7% length unstable), or fracture patterns between the 2 groups. The ≥ 100 lbs. group was significantly older (10.6 vs. 8.0 y, $P < 0.001$). There were no significant differences in final coronal angulation (1.5 vs. 3.0 degrees), sagittal angulation (2.8 vs. 3.1 degrees), or shortening (3.4 vs. 3.5 mm) between the 2 groups. There were significantly more nail removals in the < 100 lbs. group (81.4% vs. 66.7%, $P < 0.01$). Four percent of the population (10 patients) weighed ≥ 120 lbs., and aside from age (11.4 vs. 8.1 y, $P < 0.01$), there were no significant demographic or fracture pattern differences between this group and the remaining population. This heaviest group demonstrated no significant difference in shortening (3.3 vs. 3.5 mm), coronal angulation (0.8 vs. 3.0 degrees), or sagittal angulation (0.7 vs. 3.2 degrees) at radiographic union when compared with the lighter patients.

Conclusions: Stainless-steel Ender's FIMN is an effective treatment for pediatric femoral shaft fractures in patients ≥ 100 pounds with excellent radiographic outcomes and no increased risk for malunion.

Significant Reduction of Pulmonary Embolism in Orthopaedic Trauma Patients

J Orthop Trauma. 2019 Feb;33(2):78-81. doi: 10.1097/BOT.0000000000001346.
Starr AJ, Shirley Z, Sutphin PD, **Sanders D,** Eastman A, Au B, **Sathy A,** Hu G, Gebrelul A, Minei J, Cripps MW

Objective: To report results of a protocol to lessen incidence of pulmonary embolism (PE) among orthopaedic trauma patients.

Design: Retrospective review.

Setting: Level 1 trauma center.

Patient/Participants: Orthopaedic trauma inpatients were included in the study.

Intervention: On arrival, an orthopaedic trauma patient's PE risk is calculated using a previously developed tool. If possible, patients at high risk are given their first dose of enoxaparin before leaving the emergency room. If other injuries preclude enoxaparin, then chemoprophylaxis is held for 24 hours. Twenty-four hours after arrival, the patient's ability to receive enoxaparin is reassessed. If possible, enoxaparin is started, with dosing twice a day. If enoxaparin is still contraindicated, a removable inferior vena cava filter is placed. Adequacy of enoxaparin dosing is tested using anti-factor Xa assay, drawn 4 hours after the third dose of enoxaparin. If the anti-factor Xa result is less than 0.2 IU/mL, a removable inferior vena cava filter is placed. If the result is 0.2-0.5 IU/mL, enoxaparin dosing is continued. If greater than 0.5 IU/mL, the dose of enoxaparin is reduced.

Outcome Measure: The main outcome measure was rate of PE.

Results: From September 1, 2015, to December 31, 2015, our hospital admitted 420 orthopaedic trauma patients. Fifty-one patients were classed as high risk for PE. In September through December 2015, 9 sustained PE, 1 of which was fatal. From September 1, 2016, to December 31, 2016, our hospital admitted 368 orthopaedic trauma patients with comparable age and Injury Severity Score to 2015. Forty patients were at high risk for PE, 1 sustained a nonfatal PE. PE incidence from September to December 2016 was significantly lower than in 2015 (P = 0.02). Overall, 26 patients managed under the new protocol had IVCFs placed, 21 had their filters removed, and 3 died with filters in place. There were no complications during filter placement or removal. One patient had hemorrhage felt to be attributable to enoxaparin.

Conclusions: Our protocol emphasizes more robust enoxaparin dosing, and more frequent use of IVCF, but only among those at high risk. We lessened the incidence of PE, with a low complication rate.

Approach to the Hip for SCFE: The North American Perspective

J Pediatr Orthop. 2018 Jul;38 Suppl 1:S5-S12. doi: 10.1097/BPO.0000000000001183.
Sucato DJ

Abstract: The treatment of slipped capital femoral epiphysis (SCFE) in North America has seen a change over the past 15 to 20 years due to a better understanding of the blood flow supplying the femoral head, the ability to monitor the pressure/flow in real time, and greater access to the deformity with the development of surgical approaches providing that access. These advances have mainly affected the treatment of the unstable SCFE to mitigate the risk of avascular necrosis but have also been utilized for the stable SCFE when severe deformity remains. This paper will provide a summary of some of the current techniques utilized in North America in the treatment of SCFE and will focus on the studies reported on this condition from this continent. In addition, I wanted this report to reflect the opinions and practices of North American surgeons, so I polled an audience that was representative of the current North American pediatric orthopaedist.

Comparison of Fracture Location and Extent of Comminution in Isolated Scaphoid Fractures Versus Transscaphoid Fracture-Dislocations

Hand (N Y). 2018 Aug 24:1558944718795266. doi: 10.1177/1558944718795266. [Epub ahead of print]
Suszynski TM, Ben-Amotz O, Kargel JS, **Bass R, Sammer DM**

Background: Isolated scaphoid fractures (ISFs) are common, whereas transscaphoid fracture-dislocations (TSFDs) are not. Scaphoid fracture location and the extent of comminution are factors that affect treatment and outcome. The purpose of this study is to compare the radiographic characteristics of ISFs with TSFDs associated with greater arc injury.

Methods: This study is a retrospective review of all ISFs and TSFDs that presented to our institution during a 5-year period. Fracture location (along the long axis of the scaphoid) was calculated by dividing the distance from the proximal pole to the fracture by the entire length of the scaphoid. The extent of comminution was measured in millimeters along the mid-axis of the scaphoid and divided by the entire length of the scaphoid.

Results: One hundred thirty-eight scaphoid fractures in 137 patients were identified. One hundred twelve fractures (81%) were ISFs, and 26 (19%) were associated with a TSFD. The mean fracture location was more proximal in TSFDs than in ISFs. However, fractures occurred in the distal third of the scaphoid in 12% of ISFs compared with 0% of TSFDs. Nine percent of ISFs demonstrated comminution as compared with 12% of TSFDs. Extent of comminution was 16% and 28% for ISFs and TSFDs, respectively.

Conclusion: Scaphoid fractures associated with greater arc injuries are located more proximally and are more comminuted than ISFs, and distal pole fractures rarely occur in the setting of TSFDs. The increased incidence and extent of comminution in TSFDs may be suggestive of a higher energy injury mechanism.

Sleep Disturbance in Orthopaedic Trauma Patients

J Orthop Trauma. 2018 Oct;32(10):500-504. doi: 10.1097/BOT.0000000000001276.
Swann MC, Batty M, Hu G, Mitchell T, Box H, **Starr A**

Objective: To evaluate the prevalence and severity of sleep disturbance experienced by patients who have sustained a traumatic orthopaedic injury, how sleep disturbance affects the patient's perceived health quality, and identify factors associated with sleep disturbance.

Design: Cross-sectional cohort study.

Setting: Urban Level I trauma center.

Patients/Participants: Three hundred thirty-five nonconsecutive patients who presented to clinic at various stages of treatment for their traumatic orthopaedic injuries.

Main Outcome Measurements: Pittsburgh Sleep Quality Index (PSQI) and 36-item short form-36 (SF-36) survey questionnaires; injury severity score (ISS).

Results: The average PSQI score was 10.3 (± 4.8). Two hundred eighty-eight (86.0%) patients had a PSQI score ≥ 5, indicating the presence of sleep disturbance. The PSQI score was ≥ 10 in 183 (54.6%) patients, which is sleep disturbance similar to the level seen in clinical depression. Patients reported an average sleep latency of 38.9 (± 37.5) minutes, with a total nightly sleep time of 6.3 (± 1.9) hours. Univariate statistical analysis demonstrated that age, time since injury, and all components of the SF-36 were significantly associated with increased PSQI scores. When these variables were assessed with multivariate analysis to control for confounding variables, the bodily pain, vitality, and mental health components

of the SF-36 remained independently associated with PSQI ($P \leq 0.001$, 0.002, and 0.001, respectively). ISS measurements at the time of presentation were not associated with PSQI scores.

Conclusions: Our findings suggest that sleep disturbance is both highly prevalent (86% PSQI ≥ 5) and severe (54.6% PSQI ≥ 10) in patients recovering from a traumatic orthopaedic injury. The bodily pain, vitality, and mental health components of the SF-36 were independently associated with worse sleep quality. The average orthopaedic trauma patient presents with a sleep score similar to that seen in clinical sleep disorders and clinical depression. Interestingly, in our study, the severity of the overall injury burden as measured by ISS and time since injury were not independently associated with the severity of sleep disturbance, as one might expect.

Is Less More? Assessing the Utility of Early Clinical and Radiographic Follow-Up for Operative Supracondylar Humerus Fractures

J Child Orthop. 2018 Oct 1;12(5):502-508. doi: 10.1302/1863-2548.12.180054.
Thompson RM, Hubbard EW, Elliott M, **Riccio AI, Sucato DJ**

Purpose: Postoperative protocols following surgical management of supracondylar humerus fractures (SCFs) are often based upon surgeon preference rather than clinical merit. The purpose of this study is to determine the utility of early clinical and radiographic follow-up.

Methods: A retrospective review of patients who underwent closed reduction and percutaneous pinning (CRPP) for SCF between 2009 and 2015 was performed using a database of prospectively collected consecutive patient data. Previously undiagnosed neuropathies documented at the first postoperative visit were identified. Unscheduled visits and postoperative complications were compared between patients who were seen at one week and those with delayed first clinic visits.

Results: Of 873 patients, 823 (94.3%) were seen within 10 days of surgery (early follow-up) and 50 (5.7%) had a delayed first clinic appointment. Among patients seen for early follow-up, 12 (1.5%) had a previously undocumented neuropathy diagnosed but only eight (1%) had an alteration of management secondary to clinical findings. Greater than 90% of patients seen for early follow-up had radiographs performed, but only one had an alteration in management due to radiographic findings. Patients seen for early follow-up had the same rate of unscheduled visits (2.9% versus 4%, $p = 0.66$) and postoperative complications (1.6% versus 0%, $p > 0.99$) as those with delayed first appointments. Radiographic parameters were comparable at final follow-up (Baumann's angle 74.5° versus 73.7°, $p = 0.40$; lateral humeral condylar angle 40.2° versus 41.2°, $p = 0.53$).

Conclusion: The early follow-up visit after CRPP of SCF rarely leads to alterations in care and does not reduce unscheduled visits or late complications.

Ischemic Femoral Head Osteonecrosis in a Piglet Model Causes Three-Dimensional Decrease in Acetabular Coverage

J Orthop Res. 2018 Apr;36(4):1173-1177. doi: 10.1002/jor.23737. Epub 2017 Oct 9.
Upasani VV, Jeffords ME, Farnsworth CL, Padilla D, Lopreiato N, Aruwajoye OO, **Kim HKW**

Abstract: Legg-Calvé-Perthes disease (LCPD) is a childhood form of ischemic osteonecrosis marked by development of severe femoral head deformity and premature osteoarthritis. The pathogenesis of femoral head deformity has been studied extensively using a piglet model of ischemic osteonecrosis; however, accompanying acetabular changes have not been investigated. The purpose of this study was to determine if acetabular changes accompany femoral head deformity in a well-established piglet model of LCPD and to define the acetabular changes using three-dimensional computed tomography (3D CT) and modeling. Twenty-four piglets were surgically induced with ischemic osteonecrosis on the right side. The contralateral hip was used as control. At 8 weeks postoperative, pelvi were retrieved and imaged with CT. Custom software was used to measure acetabular morphologic parameters on 3D CT images. Moderate to severe femoral head deformities were present in all animals. Acetabula with accompanying femoral head deformity had a significant decrease in acetabular version and tilt ($p < 0.001$) and in coverage angle in the superior, posterior, and inferior quadrants ($p < 0.05$). These findings indicate that the development of femoral head deformity following ischemic osteonecrosis produces specific and predictable changes to the shape of the acetabulum. Acetabular changes described in patients with LCPD were observed in the piglet model. This model may serve as a valuable tool to elucidate the relationship between femoral head and acetabular deformities.

Complications During the Treatment of Diabetic Foot Osteomyelitis

Diabetes Res Clin Pract. 2018 Jan;135:58-64. doi: 10.1016/j.diabres.2017.06.002. Epub 2017 Jun 13.
van Asten SAV, Mithani M, Peters EJG, **La Fontaine J,** Kim PJ, **Lavery LA**

Aim: To identify complications of medical treatment in patients with diabetic foot osteomyelitis (DFO).

Methods: We reviewed 143 records of consecutive patients admitted with DFO, confirmed by bone histopathology or culture. Complications monitored included acute kidney injuries (AKI), development of methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant Enterococcus (VRE), gastrointestinal complications, and venous catheter-related complications during a 12-month follow-up period.

Results: Forty-seven AKI episodes were reported during follow-up; half occurred during the first hospitalization with involvement of antimicrobial therapy in 14 events (29.8%). Patients with AKI were more likely to have recurrent ulcerations (69.2% vs. 45.2%, $p = 0.02$), recurrent infections (38.5% vs. 17.3%, $p = 0.01$), and recurrent hospitalizations (43.6% vs. 28.8%, $p = 0.02$) during follow-up. Only 14 MRSA isolates were found in bone samples at baseline (9.8%). Resistant strains of MRSA and VRE were identified in 21 patients (14.7%) during follow-up. Patients re-hospitalized for infection were more likely to have resistant bacterial strains (52.6% vs. 25.8%, $p = 0.02$).

Conclusions: In this study, the rates of VRE and MRSA in bone biopsies of patients with DFO were lower than in previous reports. Acute kidney injury occurred frequently in our patient population but might not be associated with antibiotic exposure.

The Influence of Major Depressive Disorder at Both the Preoperative and Postoperative Evaluations for Total Knee Arthroplasty Outcomes

Pain Med. 2019 Apr 1;20(4):826-833. doi: 10.1093/pm/pny107.
Visser MA, Howard KJ, **Ellis HB**

Objective: The purpose of this paper is to analyze the impact of major depressive disorder, both preoperatively and one year postoperatively, on the functional and psychosocial outcomes of total knee arthroplasty (TKA).

Methods: Two hundred sixty patients undergoing a total knee arthroplasty completed both the baseline and 12-month follow-up assessments. Short-Form Health Inventory (SF36), Western Ontario and McMaster University Arthritis Index (WOMAC), and Knee Society Score (KSS) were measured both preoperatively and postoperatively. The Patient Health Questionnaire (PHQ) was used to diagnose major depressive disorder (MDD) at baseline and follow-up; patients were then classified into one of four groups: No MDD, Lost MDD, Gained MDD, and Continuous MDD. Univariate analysis compared the four groups at baseline and one-year follow-up, and change scores were analyzed using a Kruskal-Wallis test for continuous data or a chi-square test of independence for categorical data.

Results: Two hundred seven (79.60%) patients were in the No MDD group, 22 (8.50%) patients were in the Lost MDD group, 19 (7.30%) patients were in the Gained MDD group, and 12 (4.60%) patients were in the Continuous MDD group. There were significant between-group differences present in baseline measures of WOMAC and SF36 mental health summary. In addition, there were significant group differences in the follow-up WOMAC, KSS, and SF36 scores.

Conclusions: Depression was associated with poorer preoperative and postoperative TKA scores. Patients who were depressed 12 months after surgery demonstrated poorer recovery than patients who did not show depressive symptoms before TKA or within the year after.

Severity-Adjusted Risk of Long-Term Adverse Sequelae Among Children With Osteomyelitis

Pediatr Infect Dis J. 2019 Jan;38(1):26-31. doi: 10.1097/INF.0000000000002044.
Vorhies JS, Lindsay EA, Tareen NG, Kellum RJ, Jo CH, **Copley LA**

Background: The purpose of this investigation was to evaluate the risk for long-term, adverse outcomes among children with osteomyelitis.

Methods: Children with osteomyelitis were prospectively enrolled from 2012 to 2014. Care was accomplished by a multidisciplinary team according to an institutional algorithm. Data were collected to define the severity of illness during the initial hospitalization and assess short, intermediate, and long-term outcomes. Clinical examination, radiographic assessment, and functional outcome survey administration were performed at a minimum of 2-year follow-up. A comparison cohort analysis was performed according to initial severity of illness score of mild (0-2), moderate (3-6), and severe (7-10).

Results: Of 195 children enrolled, 139 (71.3%) returned for follow-up at an average of 2.4 years (range, 2.0-5.0 years). Children with severe illness were less likely to have normal radiographs (severe, 4.0%; moderate, 38.2%; mild, 53.2%, P < 0.0001), and more likely to have osteonecrosis, chondrolysis, or deformity (severe, 32.0%; moderate, 5.9%; mild, 1.3%, P < 0.0001). Functional outcome measures did not significantly differ between severity categories. By regression analysis severity of illness score, plus age less than 3 years and methicillin-resistant Staphylococcus aureus predicted severe sequelae with an area under the curve of 0.8617 and an increasing odds ratio of 1.34 per point of increase in severity score.

Conclusion: Long-term severe adverse outcomes among children with osteomyelitis occurred in 11 of 139 (7.9%) children and were predicted by initial severity of illness. Other risks that diminished the likelihood of complete resolution or increased the risk of severe sequelae included methicillin-resistant Staphylcoccus aureus etiology and young age. The majority of children with osteomyelitis do not require long-term follow-up beyond the initial treatment period.

Intermediate-Term Hip Survivorship and Patient-Reported Outcomes of Periacetabular Osteotomy: The Washington University Experience

J Bone Joint Surg Am. 2018 Feb 7;100(3):218-225. doi: 10.2106/JBJS.17.00337.
Wells J, Schoenecker P, Duncan S, Goss CW, Thomason K, Clohisy JC

Background: The Bernese periacetabular osteotomy (PAO) is an alternative to arthroplasty for treating symptomatic acetabular dysplasia, but there have been few studies on the intermediate-term outcomes of this procedure. In the present study, we assessed intermediate-term hip survival and patient-reported outcomes of PAO used to treat symptomatic acetabular dysplasia.

Methods: From July 1994 to August 2008, 238 hips (206 patients) were treated with PAO. Sixty-two had a diagnosis other than classic acetabular dysplasia, and 22 were lost to follow-up. The remaining 154 hips (129 patients) were evaluated at an average of 10.3 years postoperatively. Kaplan-Meier analysis was used to assess survivorship with an end point of total hip arthroplasty (THA). Hips were evaluated using the University of California at Los Angeles (UCLA) Activity Score, modified Harris Hip Score (mHHS), and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) pain subscale score. A WOMAC pain subscale score of ≥ 10 and/or an mHHS of ≤ 70 were considered to indicate a clinically symptomatic hip.

Results: Kaplan-Meier analysis revealed a hip survival rate of 92% (95% confidence interval [CI]: 82% to 97%) at 15 years postoperatively. Eight hips (5%) underwent THA at a mean (and standard deviation) of 6.8 ± 5.2 years. Twenty-four additional hips (16%) were considered symptomatic based on a WOMAC pain score of ≥ 10 and/or an mHHS of ≤ 70. One hundred and twenty-two hips (79%) did not undergo THA and did not meet the criteria for symptoms, and these hips had a mean mHHS of 92.4 ± 8.4, WOMAC pain subscale score of 1.2 ± 1.9, and UCLA Activity Score of 7.7 ± 2.0 at a mean of 10.1 years. A higher risk of failure was associated with fair or poor preoperative joint congruency (odds ratio [OR]: 8.65; 95% CI: 1.18 to 63.55; p = 0.034) and with a postoperative lateral center-edge angle of > 38° (OR: 8.04; 95% CI: 2.01 to 32.22). A concurrent head-neck osteochondroplasty was associated with a decreased risk of failure (OR: 0.27; 95% CI: 0.09 to 0.78; p = 0.016).

Conclusions: This study demonstrates the durability of the Bernese PAO. Fair or poor preoperative joint congruency and excessive postoperative femoral head coverage were found to be predictors of failure, while concurrent head-neck osteochondroplasty in patients with an inadequate range of motion after PAO was associated with a decreased risk of failure.

Are Complications After the Bernese Periacetabular Osteotomy Associated With Subsequent Outcomes Scores?

Clin Orthop Relat Res. 2018 Nov 8. doi: 10.1097/CORR.0000000000000566. [Epub ahead of print]
Wells J, Schoenecker P, Petrie J, Thomason K, Goss CW, Clohisy JC

Background: The Bernese periacetabular osteotomy (PAO) continues to be a commonly performed nonarthroplasty option to treat acetabular dysplasia, but only a few short-term studies have evaluated complications rigorously after PAO.

Questions/Purposes: (1) What complications are observed at 10-year mean follow-up of the Bernese PAO in patients with symptomatic acetabular dysplasia? (2) What factors are associated with these complications? (3) Do these complications affect clinical outcome scores?

Methods: We reviewed 238 hips in 206 patients treated with PAO from July 1994 to August 2008. Only PAOs performed for symptomatic acetabular dysplasia and those that had at a minimum 4-year follow-up were included. Patients who went on to THA before 4 years were included in the study. Patients with hip pain who presented with a clinical presentation of symptomatic acetabular dysplasia, radiographic evidence of femoral head uncovering, and a lateral center-edge angle < 25° were considered for PAO, and no other juxta-acetabular osteotomy was offered other than PAO. Sixty-two hips had diagnoses other than acetabular dysplasia, and 22 were lost to follow-up. The remaining 154 hips (129 patients) were evaluated by chart review at a mean of 10 years (range, 1.7-20.5 years) using the UCLA Activity Score, modified Harris Hip Score (mHHS), WOMAC, and radiographic analysis. The mean age at PAO was 26 years (range, 10-60 years) and consisted of 113 female patients (132 hips [86%]) and 16 male patients (22 hips [14%]). Complications were graded using the validated Clavien-Dindo system. Complications were assessed for each hip, and the highest complication grade was assigned to the hip if multiple complications occurred. We divided complication grades into three groups for analysis: no complications, Grade 1 complications, and complications that deviated from the standard postoperative course (Grades 2, 3, and 4). There were no Grade 5 complications. Variables with significant (p < 0.05)

univariable associations with complications were considered for inclusion in a multivariable model. Outcome variables (mHHS and WOMAC) at the most recent follow-up visit were analyzed using a generalized estimating equation approach. Analysis of variance was used to compare UCLA at the most recent follow-up among the complication classes.

Results: Major complications defined as Clavien-Dindo Grade 3/4 occurred in 14 hips (9%). After controlling for potential confounding variables, we found that increasing body mass index (BMI) (odds ratio [OR], 1.16; 95% confidence interval, 1.05-1.25; p = 0.004) was associated with increased risk of complication. In contrast, greater surgeon experience was associated with a decreased risk (OR, 0.3; p = 0.002). Complications were associated with postoperative pain and activity, WOMAC (mean ± SD: 0 complications = 1.5 ± 15.1, 1 complication = 4.3 ± 4.1, 2-3 complications = 3.8 ± 4.6; p = 0.020) and UCLA scores (mean ± SD: 0 complications = 7.8 ± 2, 1 complication = 6.7 ± 2.1, 2-3 complications = 6.5 ± 2; p = 0.003).

Conclusions: Most hips undergoing PAO have few complications. The most common major surgical complication is nonunion. Increasing BMI was a predictor of having a complication, and surgeon experience decreased complication risk. Having a complication adversely affected long-term pain and activity. To minimize complications and maximize outcomes, a patient's BMI should be assessed preoperatively, and those with excessive BMI should be counseled on the increased risk of complications. In an experienced surgeon's hands, PAO has few complications at mean 10-year follow-up and a low risk of permanent disability.

Treatment of Intra-Articular Hip Malignancy With Extra-Articular Resection, Preservation of the Acetabular Columns, and Total Hip Arthroplasty

Arthroplast Today. 2018 Sep 7;4(4):431-435. doi: 10.1016/j.artd.2018.07.007. eCollection 2018 Dec.
Wells JE, Clohisy JC, O'Keefe RJ

Abstract: Intra-articular malignant lesions of the hip present significant challenges. Resection often requires large resection of the acetabular bone and pelvic columns. Concurrent reconstruction options after intra-articular hip tumors are challenging and may necessitate the use of techniques and implants with uncertain long-term survivorship. We present a case of an intra-articular hip malignancy with extra-articular resection and preservation of the acetabular columns with reconstruction using a cementless acetabular shell fixed with screws.

Complications After Pelvic Arteriography in Patients With Pelvic Ring Disruptions

J Am Acad Orthop Surg. 2018 Nov 1;26(21):765-772. doi: 10.5435/JAAOS-D-17-00198.
Wiley M, Black S, Martin C, Barnwell J, **Starr A, Sathy A**

Introduction: Pelvic angiography with transcatheter arterial embolization (TAE) is an established intervention for management of pelvic arterial hemorrhage. This study analyzes complication rates after angiography among patients with pelvic trauma treated in the context of a multidisciplinary institutional pelvic fracture protocol.

Methods: Retrospective analysis of prospectively collected data was conducted. Demographics, fracture type, embolization (i.e., unilateral versus bilateral and selective versus nonselective), and complications (i.e., pseudoaneurysm, renal failure, soft-tissue necrosis/infection, and anaphylactic reactions) were noted.

Results: Eighty-one patients with pelvic ring injuries underwent angiography from 2009 to 2013. Complications among 41 patients who underwent angiography with TAE were compared with a control group of 40 patients who underwent angiography without TAE. Eight of 41 patients with TAE had complications (19.5%) compared with 3 of 40 (7.5%) in the control group (P = 0.19). The overall complication rate was 13.6%.

Conclusion: The use of angiography with TAE as part of an institutional pelvic fracture protocol involves an acceptable rate of complications.

Size Matters: Which Adolescent Patients Are Most Likely to Require Surgical Decompression for Lumbar Disk Herniations?

J Pediatr Orthop. 2019 Mar 28. doi: 10.1097/BPO.0000000000001371. [Epub ahead of print]
Wiley MR, Hee Jo C, Khaleel MA, **McIntosh AL**

Background: Lumbar herniated nucleus pulposis (HNP) occurs infrequently in the pediatric/adolescent population. A minority of patients with radicular symptoms fail to improve with conservative management and require discectomy. The authors hypothesize that children who ultimately require surgical intervention have an underlying lumbar stenosis predisposing them to continued symptoms.

Methods: Pediatric patients with a lumbar HNP on advanced imaging were retrospectively identified at a tertiary pediatric orthopaedic institution. Patients with spondylolisthesis, fractures, previous spine surgery, or structural thoracolumbar scoliosis were excluded. On sagittal magnetic resonance imagings, measurements were taken of the L4 and L5 vertebral body diameters (VBD) and canal diameters (CD) by 2 independent reviewers. Statistical analysis was performed using 2 sample T tests followed by logistic regression analysis. This was utilized to identify significant associations between CD and need for surgical decompression.

Results: A total of 76 patients (37 males/39 females) were identified with a lumbar HNP from 2001 to 2016. Eleven patients underwent discectomy. Sixty-five patients were managed conservatively. Age at magnetic resonance imaging was not different between groups (15.1 ± 1.7 vs. 14.9 ± 2.2 y, P = 0.82). VBD at L4 and L5 were not different between groups (P = 0.2 and 0.36, respectively). The reviewers had fair to good (0.584-0.854) interrater reliability correlation coefficients. CD was decreased in the surgically treated cohort at L4 (11.6 ± 1.6 vs. 14.2 ± 2.1 mm, P = 0.0002) and at L5 (10.1 ± 1.3 vs. 14.2 ± 2.2 mm, P < 0.00001). The ratio of CD:VBD was lower in the surgically treated group at L4 (0.36 ± 0.06 vs. 0.46 ± 0.08, P = 0.0002) and L5 (0.31 ± 0.68 vs. 0.45 ± 0.08, P < 0.00001). Patients with an L4 CD < 12.6 mm were 18.8× more likely to require surgical decompression. One hundred percent of patients with an L5 CD < 12.36 mm ultimately underwent surgical decompression.

Conclusions: Adolescent patients with congenital lumbar stenosis that develop a lumbar HNP are significantly more likely to require surgical decompression to relieve persistent radicular symptoms. An L4 CD < 12.6 mm and an L5 CD < 12.36 mm were highly correlated with the need for decompression.

Distal Femoral Valgus and Recurrent Traumatic Patellar Instability: Is an Isolated Varus Producing Distal Femoral Osteotomy a Treatment Option?

J Pediatr Orthop. 2018 Mar;38(3):e162-e167. doi: 10.1097/BPO.0000000000001128.
Wilson PL, Black SR, **Ellis HB, Podeszwa DA**

Background: Genu valgum, a risk factor for recurrent patellofemoral instability, can be addressed with a varus producing distal femoral osteotomy (DFO). The purpose of this study is to report 3-year clinical and radiographic outcomes on a series of skeletally mature adolescents with traumatic patellofemoral instability and genu valgum who underwent a varus producing DFO.

Methods: Consecutive patients (n = 11) who underwent an isolated DFO for recurrent traumatic patellar instability over a 4-year study period (2009 to 2012) were reviewed. All patients were below 19 years of age, skeletally mature, had ≥ 2 patellar dislocations, genu valgum (≥ zone II mechanical axis) and failed nonoperative treatment. Exclusion criteria included less than three-year follow-up, congenital or habitual patellar instability, osteotomy indicated for pathology other than patellar instability, or biplanar osteotomies. Demographic, clinical, and radiographic data were retrospectively analyzed. Recurrence of instability and outcome measures (Kujala and Tegner Activity Scale) were collected at final follow-up prospectively.

Results: Ten of 11 patients (average age, 16 y; range, 14 to 18 y; 4 male individuals: 7 female individuals) with an average follow-up of 4.25 years (range, 3.2 to 6.0 y) met inclusion criteria. The average body mass index (BMI) of all patients was 31.3 (range, 19.7 to 46.8) with 91% considered overweight (BMI > 25) and 55% obese (BMI > 30). The average preoperative lateral distal femoral angle was 75.4 degrees with an average correction of 10.4 degrees (range, 7 to 12 degrees) (P < 0.001). Mean patellar height ratios were reduced, with Caton-Deschamps Index significantly reduced to 1.08 (range, 0.86 to 1.30) (P < 0.005). The average postoperative Kujala score was 83.6 (range, 49 to 99) with 7 subjects (70%) reporting good to excellent function (Kujala > 80) and 8 (80%) having no further episodes of instability. The mean postoperative Tegner activity score was 5.5 (range, 3 to 7).

Conclusions: A distal femoral varus producing osteotomy may change radiographic parameters associated with patellar instability and improve clinical outcomes by reducing symptomatic patellofemoral instability in this patient population.

Incidence, Presentation, and Treatment of Pediatric and Adolescent Meniscal Root Injuries

Orthop J Sports Med. 2018 Nov 8;6(11):2325967118803888. doi: 10.1177/2325967118803888. eCollection 2018 Nov.
Wilson PL, Wyatt CW, Romero J, Sabatino MJ, Ellis HB

Background: Despite the increasing incidence of sports-related knee injuries in youth athletes, few studies have reported on the diagnosis and treatment of pediatric and adolescent meniscal root injuries.

Purpose: To describe traumatic posterior meniscal root injuries in a pediatric and adolescent population and compare the presentation of meniscal root injuries versus that of nonroot injuries.

Study Design: Cohort study; level of evidence, 3.

Methods: A study was conducted of all knee arthroscopies performed on consecutive patients treated in a pediatric sports practice from March 2012 through February 2015. All patients who were younger than 20 years at the time of their injury and who underwent an arthroscopy with meniscal injury were included. Patients with discoid lateral meniscus, atraumatic meniscal cysts, partial-thickness meniscal root injuries (LaPrade type 1), and recurrent root tears were excluded. A comparative analysis of root and nonroot injuries was performed.

Results: A total of 314 patients had surgery for meniscal injury (mean patient age, 16.0 years; range, 10.5-19.6 years). Of these patients, 58 (18.5%) posterior meniscal root injuries were identified. The root injuries were more likely to have joint line tenderness on preliminary physical examination compared with nonroot injuries (96.5% vs. 58.6%, respectively; P < .001). Root injuries rarely occurred in isolation compared with nonroot meniscal tears (6.9% vs. 17.6%; P = .021) and were frequently treated in combination with anterior cruciate ligament (ACL) injuries (86.2%). Lateral root injuries occurred more often in conjunction with ACL injuries compared with medial root injuries (84.8% vs. 22.2%; P < .001). On review of preoperative imaging, meniscal extrusion occurred more often in root injuries than in nonroot injuries (32.8% vs. 3.5%; P < .0001) and was uncommonly seen in the skeletally immature patient. Extrusion was seen more often in medial than lateral root tears (66.7% vs. 21.7%; P = .008). A majority of patients (57/58) underwent transosseous suture repair of the meniscal root.

Conclusion: When treating a pediatric or adolescent patient for a traumatic meniscal tear, a surgeon may expect to see a posterior meniscal root injury in as many as 1 in 6 patients. When treated for an ACL, contact, or multiligament injury or meniscal extrusion, a pediatric or adolescent patient may demonstrate a meniscal root avulsion or complex meniscal tear. These data provide practitioners with an improved ability to identify and treat meniscal root injuries that otherwise lead to rapid cartilage degeneration.

Assessing Health-Related Quality of Life in Patients With Diabetic Foot Disease: Why Is It Important and How Can We Improve? The 2017 Roger E. Pecoraro Award Lecture

Diabetes Care. 2018 Mar;41(3):391-397. doi: 10.2337/dci17-0029.
Wukich DK, Raspovic KM

Abstract: Patient-reported outcomes (PROs) have become an important subject in the area of diabetes-related foot complications. Self-reported health-related quality of life (HRQOL) surveys can provide a generic measure of overall health (global) and can be disease specific (i.e., diabetes) or even region specific (i.e., lower-extremity function). Analysis of PRO measures utilizing validated instruments allows health care providers to determine whether medical and surgical treatments are providing patients with the highest level of outcome possible and are actually improving HRQOL. The 36-item Short Form (SF-36), EuroQol Five-Dimension Questionnaire (EQ-5D-5L), and Foot and Ankle Ability Measure (FAAM) are examples of commonly used HRQOL surveys. Low HRQOL has been associated with higher rates of hospital admission and mortality in patients with diabetes. Previous studies have demonstrated that patients with diabetes-related foot disease have low self-reported physical quality of life but do not typically report low mental quality of life. The impact of mental quality of life may be underestimated in these patients using the SF-36. In this article, we will discuss several widely used outcome instruments used to measure patient HRQOL and the impact of diabetic foot disease on HRQOL. As health care providers, we must continue to adjust and modify our treatments to achieve the best patient outcomes and associated high quality of life. Assessing PROs will become increasingly important as health care systems transition from a volume-based reimbursement model to a value-based model.

Patients With Diabetic Foot Disease Fear Major Lower-Extremity Amputation More Than Death

Foot Ankle Spec. 2018 Feb;11(1):17-21. doi: 10.1177/1938640017694722. Epub 2017 Feb 1.
Wukich DK, Raspovic KM, Suder NC

Background: The aim of this study was to identify the most-feared complications of diabetes mellitus (DM), comparing those with diabetic foot pathology with those without diabetic foot pathology.

Methods: We determined the frequency of patients ranking major lower-extremity amputation (LEA) as their greatest fear in comparison to blindness, death, diabetic foot infection (DFI), or end-stage renal disease (ESRD) requiring dialysis. We further categorized the study group patients (N = 207) by their pathology such as diabetic foot ulcer (DFU), Charcot neuroarthropathy, foot infection, or acute neuropathic fractures and dislocations. The control group (N = 254) was comprised of patients with diabetes who presented with common non-diabetes-related foot pathology.

Results: A total of 461 patients were enrolled in this study and included 254 patients without diabetic foot complications and 207 patients with diabetic foot problems. When comparing patients with and without diabetic disease, no significant differences were observed with regard to their fear of blindness, DFI, or ESRD requiring dialysis. Patients with diabetic foot disease (61 of 207, 31.9%) were 136% more likely (odds ratio [OR] = 2.36; 95% CI = 1.51-3.70; P = .002) to rank major LEA as their greatest fear when compared with diabetic patients without foot disease (42 of 254, 16.5%) and were 49% less likely (OR = 0.51; 95% CI = 0.34-0.79; P = .002) to rank death as their greatest fear compared with patients without diabetic foot disease.

Conclusion: Patients with diabetic foot pathology fear major LEA more than death, foot infection, or ESRD. Variables that were associated with ranking LEA as the greatest fear were the presence of a diabetic-related foot complication, duration of DM ≥ 10 years, insulin use, and the presence of peripheral neuropathy.

Does 3DMR Provide Equivalent Information as 3DCT for the Preoperative Evaluation of Adult Hip Pain Conditions of Femoroacetabular Impingement and Hip Dysplasia?

Br J Radiol. 2018 Dec;91(1092):20180474. doi: 10.1259/bjr.20180474. Epub 2018 Aug 7.
Yan K, Xi Y, Sasiponganan C, Zerr J, **Wells JE, Chhabra A**

Objective: Femoroacetabular impingement (FAI) and hip dysplasia (HD) are frequently evaluated by isotropic CT (3DCT) for preoperative planning at the expense of radiation. The aim was to determine if isotropic MRI (3DMR) imaging can provide similar quantitative and qualitative morphological information as 3DCT.

Methods: Twenty-five consecutive patients with a final diagnosis of FAI or HD were retrospectively selected from December 2016-December 2017. Two readers (R1, R2) performed quantitative angular measurements on 3DCT and 3DMR, blinded to the diagnosis and each other's measurements. 3DMR and 3DCT of the hips were qualitatively and independently evaluated by a radiologist (R3), surgeon (R4), and fellow (R5). Interobserver and intermodality comparisons were performed.

Results: The ICC was good to excellent for all measurements between R1 and R2 (ICC:0.60-0.98) and the majority of intermodality measurements for R1 and R2. Average inter-reader and intermodality PABAK showed good to excellent agreement for qualitative reads. On CT, all alpha angles (AA) were significantly lower in dysplasia patients than in cam patients ($p < 0.05$). All lateral center-edge angles (LCEAs) were significantly lower in dysplasia than in cam patients ($p < 0.05$). On MR, AA at 12, 1, and 2 o'clock, and LCEA at center were significantly lower in dysplasia patients than in cam patients ($p < 0.05$).

Conclusion: 3DMR offers similar qualitative and quantitative analysis as 3DCT in adult painful hip conditions.

Advances in Knowledge: 3DMR has good potential to replace 3DCT and serve as a one-stop modality for bone and soft tissue characterizations in the preoperative evaluation of FAI and HD.

Biomechanical Efficacy of Shear-Reducing Diabetic Insoles: Elaborations on Future Design Criteria

J Prosthet Orthot. 2019 April; 31(2):82-86. doi: 10.1097/JPO.0000000000000241.
Yavuz M, Ersen A, Adams LS, Holmes CF, Wijesundara MBJ, **La Fontaine J, Wukich DK,** Richardson M

Introduction: Increasing evidence suggests that plantar shear forces and related stresses play a major role in diabetic foot ulcerations. Several orthotic devices are commercially available to reduce plantar shear forces within the shoe. The biomechanical efficacy of these devices was not tested in vivo. To measure spatiotemporal characteristics of gait to assess the efficacy of such shear-reducing insoles (SRIs), control insoles were also tested for comparison purposes.

Material and Methods: Eighteen healthy volunteers walked along a 30.5-m line while wearing three types of insoles in randomized order. Spatiotemporal parameters of gait were quantified. Statistical comparisons between the control and SRIs were conducted using repeated measures analysis of variance. Intraclass correlation coefficients (ICCs) were also calculated to reveal the repeatability of the trials. Step length, gait speed, and cadence of the subjects remained similar regardless of the insole type.

Results: No significant difference was observed in any variable. The ICC values revealed excellent repeatability.

Conclusions: The lack of changes in gait parameters in these results suggest that shear-reducing diabetic inserts did not decrease plantar shear forces as intended. This might be caused by unrealistic in vitro testing conditions during the prototype development. Future designs should also consider friction at the lateral walls of the inserts, an increase in step repetition that accompanies a decrease in gait speed and/or step length, and a possible temperature increase within the shoe. We conclude that the future SRIs need to be redesigned based on comprehensive biomechanical guidelines.

Temperature as a Causative Factor in Diabetic Foot Ulceration: A Call to Revisit Ulcer Pathomechanics

J Am Podiatr Med Assoc. 2018 Nov 14. doi: 10.7547/17-131. [Epub ahead of print]
Yavuz M, Ersen A, Hartos J, **Lavery LA, Wukich DK,** Hirschman GB, Armstrong DG, Quiben MQ, Adams LS

Background: Diabetic foot ulcers are a major burden to patients and to the health care systems of many countries. To prevent and/or treat ulcers more effectively, predictive biomarkers are needed. We examined temperature as a biomarker and as a causative factor in ulcer development.

Methods: Thirty-seven individuals with diabetes were enrolled in this observational case-control study: nine with diabetic neuropathy and ulcer history (DFU), 14 with diabetic neuropathy (DN), and 14 non-neuropathic participants (DC). Resting barefoot plantar temperatures were recorded using an infrared thermal camera. Mean temperature in each region was determined based on 4 anatomical regions: Hallux, medial forefoot, central forefoot, and lateral forefoot, and separate linear models with specified contrasts between DFU, DN, and DC groups were set to reveal mean differences for each foot region while controlling for group characteristics.

Results: Mean temperature readings in each foot region were higher than 30.0° C in the DFU and DN compared to the DC group with all temperatures below 30.0° C. Mean differences were greatest between the DFU and the DC group, with mean differences ranging from 3.2° C in the medial forefoot to 4.9° C in the hallux.

Conclusions: Increased plantar temperatures in individuals with a history of ulcers may include acute temperature increases from plantar stresses, chronic inflammation from prolonged stresses, and impairment in temperature regulation from autonomic neuropathy. Diabetic foot temperatures, particularly in those with previous ulcers, may easily reach hazard thresholds indicated by prior pressure ulcer studies. The results necessitate further exploration of temperature in the diabetic foot and how it may contribute to ulceration.

Proximity of the Neurovascular Structures During All-Inside Lateral Meniscal Repair in Children: A Cadaveric Study

J Exp Orthop. 2018 Dec 18;5(1):50. doi: 10.1186/s40634-018-0166-0.
Yen YM, Fabricant PD, Richmond CG, Dingel AB, Milewski MD, **Ellis HB, Wilson PL,** Mayer SW, Ganley TJ, Shea KG

Purpose: Meniscal repair has become increasingly common in a pediatric and adolescent population. All-inside repair techniques are utilized more often given their ease of insertion and decreased operative time required. However, there are possible risks, including damage to adjacent neurovascular structures. The purpose of this study was to examine the proximity of the neurovascular structures during lateral meniscus repairs in pediatric specimens simulating a worst-case scenario.

Methods: Ten pediatric cadaveric knees (age 4-11) were utilized and simulated lateral meniscal repair through the posterior horn of the lateral meniscus, and both medial and lateral to the popliteal hiatus through the body of the lateral meniscus was performed with an all-inside meniscal repair device. The distance to the popliteal artery or peroneal nerve was measured.

Results: During posterior horn repair, the average distance from the all-inside device to the popliteal artery was 1.9 mm ± 1.1 mm. There was penetration of the artery in one specimen. During repair on the medial side of popliteal hiatus, the average distance from the all-inside device to the peroneal nerve was 3.2 mm ± 2.0 mm. During repair on the lateral side of popliteal hiatus, the average distance from the all-inside device to the peroneal nerve was 12.4 mm ± 3.7 mm.

Conclusions: This study demonstrates that the proximity of the neurovascular structures to the lateral meniscus in children is extremely close and at high risk during meniscal repair with all-inside devices. This study gives important data for the proximity of these structures during these repair techniques.

Clubfoot Does Not Impair Gross Motor Development in 5-Year-Olds

Pediatr Phys Ther. 2018 Apr;30(2):101-104. doi: 10.1097/PEP.0000000000000504.
Zapata KA, **Karol LA,** Jeans KA, Jo CH

Purpose: To evaluate the gross motor development of 5-year-olds using the Peabody Developmental Motor Scales, 2nd Edition (PDMS-2), test after initial nonoperative management of clubfoot as infants.

Methods: The PDMS-2 Stationary, Locomotion, and Object Manipulation subtests were assessed on 128 children with idiopathic clubfeet at the age of 5 years. Children were categorized by their initial clubfoot severity as greater than 13, unilateral or bilateral involvement, and required surgery.

Results: Children with treated clubfeet had average gross motor scores (99 Gross Motor Quotient) compared with age-matched normative scores. Children with more severe clubfeet required surgery significantly more than children with less severe scores (P < .01). Peabody scores were not significantly different according to initial clubfoot severity, unilateral versus bilateral involvement, and surgical versus nonsurgical outcomes.

Conclusion: Clubfoot does not significantly impair gross motor development in 5-year-olds.

Gross Motor Function at 10 Years of Age in Children With Clubfoot Following the French Physical Therapy Method and the Ponseti Technique

J Pediatr Orthop. 2018 Oct;38(9):e519-e523. doi: 10.1097/BPO.0000000000001218.
Zapata KA, **Karol LA,** Jeans KA, Jo CH

Purpose: To evaluate gross motor skills [Bruininks-Oseretsky Test of Motor Proficiency, 2nd ed. (BOT-2)] of patients with idiopathic clubfoot initially treated nonoperatively with either the French functional physical therapy (PT) method or the Ponseti technique at age 10 years.

Methods: The BOT-2 was administered by trained physical therapists on patients with idiopathic clubfoot at age 10 years. The cohort was divided by initial treatment method (PT or Ponseti), and compared. Subsequent analyses included comparisons of: initial clubfoot severity (Dimeglio scores: ≤13 vs. >13), laterality (unilateral vs. bilateral), and surgical versus nonoperative outcome.

Results: Of the 183 patients tested, 172 were included. The Ponseti and PT groups did not significantly differ according to age, height, weight, body mass index, ankle dorsiflexion, sex, average initial Dimeglio score, laterality, or surgical versus nonsurgical outcome. Overall, patients with treated clubfoot had average gross motor BOT-2 scores compared with age-matched peers. Patients in the PT group scored higher on Running Speed/Agility (P = 0.019), Body Coordination percentile rank (P = 0.038), and Strength and Agility percentile rank (P = 0.007) than patients treated by the Ponseti technique. Patients with bilateral clubfoot scored significantly lower on the Balance subtest (P < 0.01) and Body Coordination percentile rank (P < 0.01) than those with unilateral clubfoot. Patients who required surgery scored significantly lower on the Balance subtest (P = 0.04) than those who did not require surgery.

Conclusions: Clubfoot may impair balance in 10-year-olds with bilateral involvement and those requiring surgery. Future research should evaluate whether components of the PT method may improve gross motor outcomes as a supplement to the Ponseti technique.

The Basic Science of Dupuytren Disease

Hand Clinic. 2018 Aug;34(3):301-305.
Zhang AY, Kargel JS

Abstract: Dupuytren disease (DD) is a fibroproliferative condition affecting the hands of millions of patients worldwide. The hypothesis of pathogenesis involves both genetic factors and internal factors. Recent genome-wide association studies have provided much-needed evidence for the long-held belief of a strong genetic component to the pathogenesis of DD. Specifically, abnormal activation of the Wnt signaling pathway plays an important role. Regarding internal factors, both microvascular angiopathy and ischemia have been shown to lead to activation of growth factor TGF-β1 and proliferation of myofibroblasts.

The Lumbar Gap Measurement in Lenke 1-4C Curves

Spine Deform. 2018 May - Jun;6(3):241-249. doi: 10.1016/j.jspd.2017.11.001.
Zhang H, **Richards BS, Sucato DJ,** Jo CH, Tran D, Wang L

Study Design: Retrospective review.

Objectives: To assess whether the lumbar gap (LG) measurement, which is the distance between the center sacral vertical line and the concave edge of the apical vertebra of the lumbar curve, would be a useful tool to predict the need for lumbar curve fusion in the Lenke 1-4C curves.

Summary of Background Data: The current treatment guidelines of selective thoracic fusion in the Lenke 1-4C curves are not routinely accepted.

Methods: One hundred three adolescent idiopathic scoliosis (AIS) patients had undergone either selective thoracic fusion (STF) or both thoracic and lumbar curves fusion (TLF) for Lenke 1-4C curves. The correlations between the fusion decision-making and preoperative LG, coronal balance, thoracic and lumbar Cobb, apical vertebra translation, and rotation were analyzed. The radiographic outcomes and SRS-30 of a minimum 2-year follow-up were reviewed in each group.

Results: A total of 51 patients (49.5%) underwent an STF, and 52 patients (50.5%) underwent a TLF. The mean LG was 22.0 ± 8.8 mm in the TLF, which was 2.3 times greater than the STF (9.6 ± 3.9 mm) ($p < .0001$). Only 5% of the lumbar curves were fused when the LG was 10 mm or less. Ninety percent of the lumbar curves were fused when the LG was 16 mm or greater, and 100% lumbar curves were fused with an LG of 21 mm or greater. The preoperative coronal imbalance to the left in the TLF was significantly greater than the STF. A mean 47% thoracic correction corresponded to a mean 39% spontaneous correction of the lumbar curve obtained in the SFT, which was significantly different from the TLF (56% and 65%). There were no differences in the SRS-30 scores at 2 years postoperatively between the STF and the TLF.

Conclusion: The lumbar curve should not be fused when the LG was 10 mm or less and very likely should be fused when the LG exceeds 20 mm in the Lenke 1-4C AIS patients.

Morphometric Analysis of Vertebral Growth Using Magnetic Resonance Imaging in the Normal Skeletally Immature Spine

Spine (Phila Pa 1976). 2018 Jan 15;43(2):133-140. doi: 10.1097/BRS.0b013e3181c80ec5.
Zhang H, **Sucato DJ,** Nurenberg P, McClung A

Study Design: Morphometic analysis of the thoracic and lumbar pedicle, vertebral body, and spinal canal in the normal infantile and juvenile patients using magnetic resonance imaging (MRI).

Objective: To 3-dimensionally characterize the growth of the vertebral column in vivo and define the accurate dynamic growth rate of the normal immature spine.

Summary of Background Data: There is a relationship between growth of the spine and the development of spinal deformity. Currently available information regarding vertebral column growth is remarkably limited and poorly defined. The detailed morphologic research is needed to obtain accurate data with regard to growth of the vertebra, including coronal, sagittal, and axial growth information for normal states.

Methods: A total of 34 pediatric patients with a normal straight spine who had MRI from thoracic vertebra 1 to lumbar vertebra 5 were assigned to 3 groups: infantile group (n = 11), 0 to 3 years of age; juvenile-young group (n = 16), 4 to 7 years of age; and juvenile-old group (n = 7), 8 to 10 years of age. True transverse and midsagittal MRI images were used for pedicle (width and length), vertebral body (height, depth, and width), and spinal canal area measurements.

Results: The mean increase of the pedicle width and length was 0.7 mm (16%) and 3.2 mm (18%) from the infantile to the juvenile-young, and was 0.9 mm (15%) and 2.2 mm (11%) through the juvenile-old group. The mean increase of the vertebra body width, depth, and height were 3.6 mm (15%), 4.5 mm (27%), and 3.1 mm (27%), respectively, from the infantile to the juvenile-young, and were 2.9 mm (10%), 1.9 mm (9%), and 2.1 mm (15%), respectively, through the juvenile-old group. The mean increase of the spinal canal area was 41 mm (19%) from the infantile to the juvenile-young and was only 1.8 mm (0.7%) through the juvenile-old group.

Conclusion: The current study established the growth of the pedicle, spinal canal, and vertebral body in vivo in a sample of normal pediatric subjects. The vertebral growth rate in the infantile and the juvenile-young period was significantly greater than that in the juvenile-old period. Spinal canal growth is associated with the growth of the pedicle width and has little growth after the juvenile-young period. Pedicle screw fixation would be unlikely to influence the size of the spinal canal after the early juvenile period, but may disturb the pedicle growth in length.

3D CT Segmentation of CAM Type Femoroacetabular Impingement-Reliability and Relationship of CAM Lesion With Anthropomorphic Features

Br J Radiol. 2018 Dec;91(1092):20180371. doi: 10.1259/bjr.20180371. Epub 2018 Sep 12.
Zhang L, **Wells JE,** Dessouky R, Gleason A, Chopra R, Chatzinoff Y, Fey NP, Xi Y, **Chhabra A**

Objective: Evaluate feasibility and reliability of 3D CT semi-automatic segmentation and volumetrics of CAM lesions in femoroacetabular impingement and determine correlations with anthropometrics.

Methods: A consecutive series of 43 patients with CAM type FAI underwent 3D CT. Twenty males and 23 females (30 unilateral and 13 bilateral symptomatic hips) were included. Fifty-six CAM lesions and femoral heads were segmented by two readers. Radial images were obtained for alpha angles. Pearson and ICC correlations were used for analysis.

Results: In 43 patients (male: female = 1 : 1.15), mean ± SD of age, height, BMI were 36.6 ± 11.47 years, 1.72 ± 0.10 meters and 26.25 ± 4.31 kg m-2. Femoral head and bumps were segmented in 4 min. Inter-reader reliability was good to excellent for volumetrics and poor for alpha angles. Mean ± SD of CAM lesion and femoral head volumes were significantly larger (6.7 ± 2.5 cc3 and 62.9 ± 10.8 cc3) for males than females ($p < 0.001$), and these increased with increasing patient height (Pearson correlation and p-values = 0.45, 0.0006; 0.82, < 0.0001, respectively).

Conclusion: Volumetric analysis of CAM lesion shows better inter-reader reliability than alpha angle measurements. CAM and femoral head volumes exhibit significant positive correlations with patient heights and male gender that may aid in preoperative planning for femoroplasty.

Unplanned Above-Knee Amputation After Initial Below-Knee Amputation in the 30-Day Postoperative Period

Accepted to *American Journal of Physical Medicine and Rehabilitation.* 2019 Feb.
Ahn J, **Del Core MA,** Liu GT, Van Pelt M, Lalli T, Raspovic K, Wukich D

Introduction: The aim of this study was to determine patient factors associated with unplanned above-knee amputation (AKA) after below-knee amputation (BKA) in the perioperative period.

Methods: Patients who underwent BKA between 2011 and 2015 were retrospectively reviewed in the American College of Surgeons National Surgical Quality Improvement Program® (ACS-NSQIP) database.

Results: Out of 7,868 patients, 2.7% underwent unplanned AKA after BKA. The average time to conversion to AKA was 16.5 days. Age over 65 years (OR 1.5, 95% confidence interval [CI] 1.01-2.08), coagulopathy (OR 1.58, 95% CI 1.09-1.7), American Society of Anesthesiologists (ASA) classification IV-V (OR 1.47, 95% CI: 1.03-2.10), and surgical site infection present at time of surgery (OR 5.30, 95% CI: 2.59-9.92) were independent risk factors of unplanned AKA. Conversely, diabetes was associated with significantly decreased odds of unplanned AKA (OR 0.63, 95% CI 0.44-0.91). Diabetic patients treated with insulin had fewer unplanned AKAs compared to non-diabetic patients (p = .0002). However, no difference was observed between diabetic patients treated with non-insulin agents and non-diabetic patients (p = .097).

Conclusion: In this study, age, presence of coagulopathy, surgical site infection at the time of amputation, and diabetes status correlated with higher risk of BKA conversion to AKA.

Trifurcate Origin of Long Head of Biceps Brachii: A Case Report and Literature Review

J Orthop Case Reports. 2019 Jul-Aug; 8(4):70-73. doi: 10.13107/jocr.2250-0685.1166.
Cutler HS, Tao MA, O'Brien SJ, Taylor SA

Introduction: Variant anatomy of the intra-articular portion of the long head of the biceps tendon (LHBT) is rare, and its clinical significance is poorly understood. However, these variants are encountered with increasing frequency due to increasing use of shoulder arthroscopy.

Case Report: We report a case of a trifurcate intra-articular LHBT, a variation which, to our knowledge, has not been previously described. The patient was an adult male presenting with chronic atraumatic shoulder pain that worsened with overhead activity. On arthroscopy, the LHBT was found to have three origins from the (1) supraspinatus tendon, (2) superior labrum, and (3) rotator interval that joined together distally within the biceps tunnel. We believe the split tendon may have caused impingement in the biceps tunnel; therefore, the patient was treated with subpectoral tenodesis. He also underwent subacromial decompression and rotator cuff debridement.

Conclusion: This case highlights the importance of surgeon and radiologist awareness of split LHBT variant anatomy, such that misdiagnosis and unnecessary treatment may be avoided.

The Evaluation and Treatment of Diabetic Foot Ulcers and Diabetic Foot Infections

Foot & Ankle Orthopaedics. 2018 July. doi: 10.1177/2473011418788864.
Del Core MA, Ahn J, **Lewis R,** Raspovic K, Lalli T, Wukich D

Abstract: Diabetic foot ulcers and infections are common complications of diabetic foot disease. Additionally, these complications are a common cause of morbidity and impose a substantial burden to the patient and society. It is imperative to understand the major contributing factors, namely, diabetic neuropathy, peripheral arterial disease, and immune system dysfunction, in order to guide treatment. Management of diabetic foot disease begins with a detailed history and thorough physical examination. This examination should focus on the manifestations of diabetic neuropathy and peripheral arterial disease, and, in particular, any evidence of diabetic foot ulcers or infection. Prevention strategies should include a multidisciplinary approach centered on patient education.

Clinical and Radiographic Outcomes of Femoral Head Fractures Associated With Traumatic Hip Dislocations

Accepted to *Strategies in Trauma and Limb Reconstruction.* 2019 Feb.
Del Core MA, Gross B, Ahn J, **Wallace SB,** Starr A

Background: Femoral head fractures are an uncommon but severe injury. These high-energy injuries typically occur in association with traumatic hip dislocations. Initial treatment includes urgent concentric reduction; however, controversy exists regarding specific fracture management. The well-known complications of avascular necrosis, post-traumatic arthritis, and heterotrophic ossification can leave patients with a significant functional loss of their affected hip. The purpose of this study is to evaluate the clinical and radiographic outcomes of femoral head fractures.

Methods: A retrospective review was performed at our institution assessing all patients who presented from 2007 to 2015 with a femoral head fracture associated with a hip dislocation and at least 6 months of clinical and radiographic follow-up. Twenty-two patients met our inclusion criteria. There were 15 males and 7 females with an average age of 36 years (range: 17-55). The average follow-up time was 18 months (range: 6-102). Fractures were classified according to the Pipkin classification. The Thompson and Epstein score was used to determine functional outcomes.

Results: There were 5 Pipkin I, 3 Pipkin II, 0 Pipkin III, and 14 Pipkin IV femoral head fractures. Sixteen patients were successfully closed reduced in the emergency department (ED), and six patients required open reduction after failed reduction in the ED. Four patients (18%) were successfully treated with closed reduction alone, and 18 patients (82%) required operative intervention. Of those undergoing operative intervention, 1 patient underwent excision of the femoral head fragment, 7 underwent open reduction internal fixation (ORIF) of the femoral head, 9 underwent ORIF of the acetabulum, and 1 underwent ORIF of the femoral head and the acetabulum. Nine patients (41%) had an uneventful postoperative course. Two patients (9%) developed avascular necrosis (AVN), both requiring total hip arthroplasty (THA). Five patients (23%) developed post-traumatic arthritis (PTA), two eventually requiring a THA. Two patients (9%) had sciatic nerve palsy. One patient (5%) developed a postoperative infection, and four patients (18%) developed heterotrophic ossification (HO), none requiring operative treatment. Two patients (9%) had persistent anterolateral thigh numbness. Overall functional results were excellent in 6 patients (27%), good in 6 (27%), fair in 7 (32%), and poor in 3 patients (14%). Four patients (18%) required a THA.

Conclusions: Femoral head fractures are a rare injury with well-known complications. Early diagnosis and concentric reduction are the prerequisites for successful treatment. This study adds to the growing literature on femoral head fractures associated with hip dislocations in efforts to define treatment plans and to guide patient expectations.

Surgically Relevant Anatomy of the Axillary and Radial Nerves in Relation to the Latissimus Dorsi Tendon in Variable Shoulder Positions: A Cadaveric Study

Shoulder & Elbow. EPub ahead of print, Feb. 2019. doi: 10.1177/1758573218825476.
Gates S, Sager B, Collett G, Chhabra A, Khazzam M

Background: The purpose of this study was to define the relationship of the axillary and radial nerves, particularly how these are affected with changing arm position.

Methods: Twenty cadaveric shoulders were dissected, identifying the axillary and radial nerves. Distances between the latissimus dorsi tendon and these nerves were recorded in different shoulder positions. Positions included adduction/neutral rotation, abduction/neutral rotation for the axillary nerve, adduction/internal rotation, adduction/neutral rotation, adduction/external rotation, and abduction/external rotation for the radial nerve.

Results: Width of the latissimus tendon at its humeral insertion was 29.3 ± 5.7 mm. Mean distance from the latissimus insertion to the axillary nerve in adduction/neutral rotation was 24.2 ± 7.1 mm; the distance increased to 41.1 ± 9.8 mm in abduction/neutral rotation. Mean distance from the latissimus insertion to the radial nerve was 15.3 ± 5.5 mm with adduction/internal rotation, 25.8 ± 6.9 mm in adduction/neutral rotation, and 39.5 ± 6.8 mm in adduction/external rotation. Mean distance increased with abduction/external rotated 51.1 ± 7.4 mm.

Conclusions: Knowing the axillary and radial nerve locations relative to the latissimus dorsi tendon decreases the risk of iatrogenic nerve injury. Understanding the dynamic nature of these nerves related to different shoulder positions is critical to avoid complications.

Propionibacterium Acnes Persists Despite Various Skin Preparation Techniques

Arthroscopy. 2018 Jun;34(6):1786-1789. doi: 10.1016/j.arthro.2018.01.019. Epub 2018 Mar 24.
Heckmann N, Sivasundaram L, **Heidari KS,** Weber AE, Mayer EN, Omid R, Vangsness CT Jr., Hatch GF 3rd

Purpose: To investigate the efficacy of various skin preparations at eradicating Propionibacterium acnes in the dermal layer of the skin.

Methods: Twelve healthy volunteers consented to participate in this study. Each subject's upper back was prepped using 4 different techniques: an isopropyl alcohol control, chlorhexidine gluconate paint, chlorhexidine gluconate plus a mechanical scrub, and a high-concentration chlorhexidine gluconate plus a mechanical scrub. A 3-mm dermal punch biopsy specimen was obtained at each preparation site. The 4 punch biopsy specimens were cultured for 14 days to assess for P. acnes growth. A Fisher's exact test was used to compare the proportion of positive cultures in each group and across biopsy sites. A Skillings-Mack test was used to compare the degree of culture positivity between the treatment arms.

Results: There were no reported complications in any of our subjects. P. acnes grew in 7 of the 12 control sites, 5 of the 12 chlorhexidine gluconate sites, 6 of the 12 chlorhexidine plus mechanical scrub sites, and 6 of the 12 high-concentration chlorhexidine gluconate plus mechanical scrub sites. There were no statistically significant differences between any of the treatment arms (P = .820).

Conclusions: P. acnes persisted despite a variety of clinically relevant skin antisepsis preparations and techniques.

Severe Burn-Induced Inflammation and Remodeling of Achilles Tendon in a Rat Model

Shock. 2018 Sep;50(3):346-350. doi: 10.1097/SHK.0000000000001037.
Hernandez P, Buller D, Mitchell T, Wright J, Liang H, **Manchanda K,** Welch T, Huebinger RM, Carlson DL, Wolf SE, Song J

Abstract: Severe burn causes systemic inflammation and hypercatabolism, resulting in damage to multiple organs distant to the burn site, including the musculoskeletal system. Bone mass and muscle loss have been reported. However, tendon that connects bone and muscle has not been studied in comparable detail. Here we aimed to characterize the molecular and functional changes in Achilles tendon triggered by severe burn. Forty male Sprague-Dawley rats received 40% total body surface area scald burn. Achilles tendons were collected up to 14 days postburn. Sham-treated animals served as a control group. We analyzed tendons for changes in expression of IL-6, IL-1β, TNF, MMP9, MMP13, TGFβ1, Collagens I and III, and for morphological and biomechanical changes. Gene expression of IL-6 and IL-1β as well as MMP9 and MMP13 increased in rat tendon 3 days after burn. Col3a1 increased at day 3 and col1a1 at day 7. At day 14, TGFβ1 increased, whereas the protein ratio for collagens I/III decreased, indicating tendon remodeling. Histological analysis with H&E and Picrosirius red staining further revealed a decrease in organized collagen fibers 14 days after burn. Biomechanical analysis showed a decrease in stiffness and ultimate force of tendons in burn rats. We conclude that tendinopathy was observed in Achilles tendons 14 days after severe burn, via the induction of inflammation and remodeling. The present study provides a model of tendinopathy that may be used for the development of therapeutic approaches after burn.

Sleep Quality in Patients With Rotator Cuff Disease

J Am Acad Orthop Surg. 2018 Mar 15;26(6):215-222. doi: 10.5435/JAAOS-D-16-00547.
Khazzam MS, Mulligan EP, Brunette-Christiansen M, **Shirley Z**

Background: Little is known about the influence of rotator cuff pathology on sleep. The purpose of this study was to determine which patient-reported factors correlate with sleep disturbance in patients with rotator cuff disease.

Methods: A nonrandomized, cross-sectional cohort study was performed to evaluate the effects of rotator cuff disease on sleep quality. Data collected at time zero (before any treatment) included the Single Assessment Numeric Evaluation rating, the American Shoulder and Elbow Surgeons score, the Pittsburgh Sleep Quality Index, patient demographics, and medical comorbidities. Statistical analysis included the Pearson correlation and multiple regression analysis to determine which patient-reported factors were associated with sleep disturbance.

Results: Nocturnal pain was reported by 91% of the 391 participants (274 with tendinitis and 117 with rotator cuff tears). Participants had a mean age of 57 years. Pearson correlation coefficients determined that poor sleep quality in one group or both the tendinitis and the rotator cuff tear groups was associated with higher pain visual analog scale scores (0.27 and 0.31; $P = 0.004$ and $P < 0.0001$, respectively), depression (0.27 and 0.30; $P < 0.01$), female sex (0.24 and 0.27; $P < 0.001$), presence of low back pain (0.25 and 0.27; $P < 0.01$), diabetes mellitus (0.24 in the rotator cuff tear group; $P < 0.01$), and increased body mass index (0.22 and 0.27; $P = 0.02$).

Discussion: The status of the rotator cuff did not correlate with increasing symptoms of shoulder pain or with worse sleep quality as measured by the Pittsburgh Sleep Quality Index. These results support the theory that worsening symptoms of shoulder pain may not be clearly associated with rotator cuff disease severity.

Conclusion: Worse sleep quality scores in patients with rotator cuff disease are associated with pain, depression, female sex, low back pain, diabetes mellitus, and high body mass index. Overall, sleep quality did not differ among patients with varying rotator cuff disease severity. Only hypertension (in patients with rotator cuff tears) and concurrent cervical pathology (in patients with tendinitis) were uniquely related to the disease classification. Further investigation is needed to better define how these factors interact and influence nocturnal shoulder pain and sleep quality in patients with rotator cuff disease.

Fibular Groove Morphology and Measurements on MRI: Correlation With Fibularis Tendon Abnormalities

Surg Radiol Anat. 2019 Jan;41(1):75-85. doi: 10.1007/s00276-018-2134-x. Epub 2018 Nov 8.
Matcuk GR Jr, Patel DB, Cen S, **Heidari KS,** Tan EW

Purpose: Fibular (peroneal) groove morphology may influence fibularis tendon pathology, including tendinosis, tears, and luxation. The study goal was to evaluate the inter-reader agreement of morphologic characterization and measures of the fibular groove at two different levels on MRI and correlation with fibularis tendon pathology.

Materials and Methods: Forty-seven ankle MRIs in patients without lateral ankle pain were reviewed by two musculoskeletal radiologists. Fibular groove morphology and various measurements were assessed at both the level of the tibial plafond and 1 cm proximal to the tip of the lateral malleolus. Fibularis tendon pathology and other variants were also recorded. Intraclass correlation (ICC) and kappa statistic (κ) were applied to assess interobserver agreement. Receiver operating characteristic (ROC) and area under the curve (AUC) analysis were performed to determine correlation between fibular groove morphometry and fibularis (peroneus) brevis tendon tears.

Results: Between readers, there was fair-to-excellent agreement (ICC = 0.61-0.95) for performed fibular groove measurements and moderate-to-very good agreement for identification and description of fibular groove and fibularis tendon morphology and pathology and normal variants in this region (κ = 0.46-1), with the exception of fibular groove morphology at 1 cm proximal to the lateral malleolar tip (κ = 0.34). Individually, no measurement or description of pathology could discriminate between patients with or without fibularis brevis tendon tears except fibularis brevis tendinosis (AUC = 0.87 for reader 1).

Conclusion: There is overall moderate-to-excellent inter-reader agreement for various measurements and descriptors of fibular groove and fibularis tendon morphometry and pathology, including novel measurements introduced in this study.

A Nationwide Analysis of Failed Irrigation and Debridement for Pediatric Septic Arthritis of the Hip

J Pediatr Orthop B. 2019 Mar 6. doi: 10.1097/BPB.0000000000000621. [Epub ahead of print]
Sabour AF, Alluri RK, Heckmann N, **Heidari KS,** Hatch GFR 3rd, VandenBerg C

Abstract: Irrigation and debridement (I&D) is the gold standard for treatment of pediatric septic arthritis of the hip. If the index surgery fails, subsequent surgery may be required to eradicate the infection, resulting in substantial increases in morbidity, health care costs, and psychosocial burden. The purpose of this study was to identify the incidence of failed I&D for pediatric septic arthritis of the hip, defined by the need for at least one subsequent surgical intervention, and potential risk factors for failed initial I&D. The Kids' Inpatient Database was used to extract data for pediatric patients diagnosed with septic arthritis of the hip from 1997 to 2012. Factors such as patient demographics, preoperative comorbidities, inpatient variables, and hospitals variables were assessed for associations with successful versus failed I&Ds. During the period examined, 3,341 (94.3%) children were successfully treated with a single I&D, whereas 203 (5.7%) children required at least one additional surgery during the same hospitalization. Univariate analysis found anemia, coagulopathy, and electrolyte disorders to be associated with repeat surgery. Patients who required multiple surgeries had significantly longer lengths of stay (11.3 vs. 6.9 days), higher likelihood of being discharged with home health (39% vs. 25%), and higher total overall inpatient costs ($58,400 vs. $31,900). On the basis of the results of this study, the nationwide incidence of patients requiring multiple I&Ds was 5.7%. Patient preoperative comorbidities such as coagulopathy and hospital characteristics such as government ownership and teaching status were significantly associated with failed initial I&D for septic arthritis of the hip. We believe this data can be useful in guiding future research efforts and providing clearer anticipatory guidance to patients and guardians.

Discharge Destination After Shoulder Arthroplasty: An Independent Risk Factor for Readmission and Complications

J Am Acad Orthop Surg. 2018 Apr 1;26(7):251-259. doi: 10.5435/JAAOS-D-16-00841.
Sivasundaram L, **Heidari KS,** Alluri RK, Heckmann N, McKnight B, Hill JR, Hatch GFR

Introduction: Postdischarge disposition after shoulder replacement lacks uniform guidelines. The goal of this study was to identify complication and readmission rates by discharge disposition and determine whether disposition was an independent risk factor for adverse events, using a statewide database.

Methods: Data from the California Office of Statewide Health Planning and Development discharge database were used. Patient information was assessed, and 30- and 90-day complication rates were identified. Univariate and multivariate analyses were used to determine the complication risk.

Results: From 2011 to 2013, 10,660 procedures were identified, with 7,709 patients discharged home, 1,858 discharged home with home health support, and 1,093 discharged to post-acute care (PAC) facilities. Patients discharged to PAC facilities or to home with health support tended to be older, female, and using Medicare. After controlling for confounders, at 30 and 90 days, patients discharged to PAC facilities were found to be more likely to experience a complication.

Discussion: Discharge to a PAC facility was an independent risk factor for complications and readmission.

Can Real-Time Monitoring With a Controlled Advancement Drill Decrease Plunge Depth?

Accepted to *J Bone and Joint Surg* 2019.
Wallace SB, Cherkashin A, Samchukov M, Wimberly RL, Riccio AI

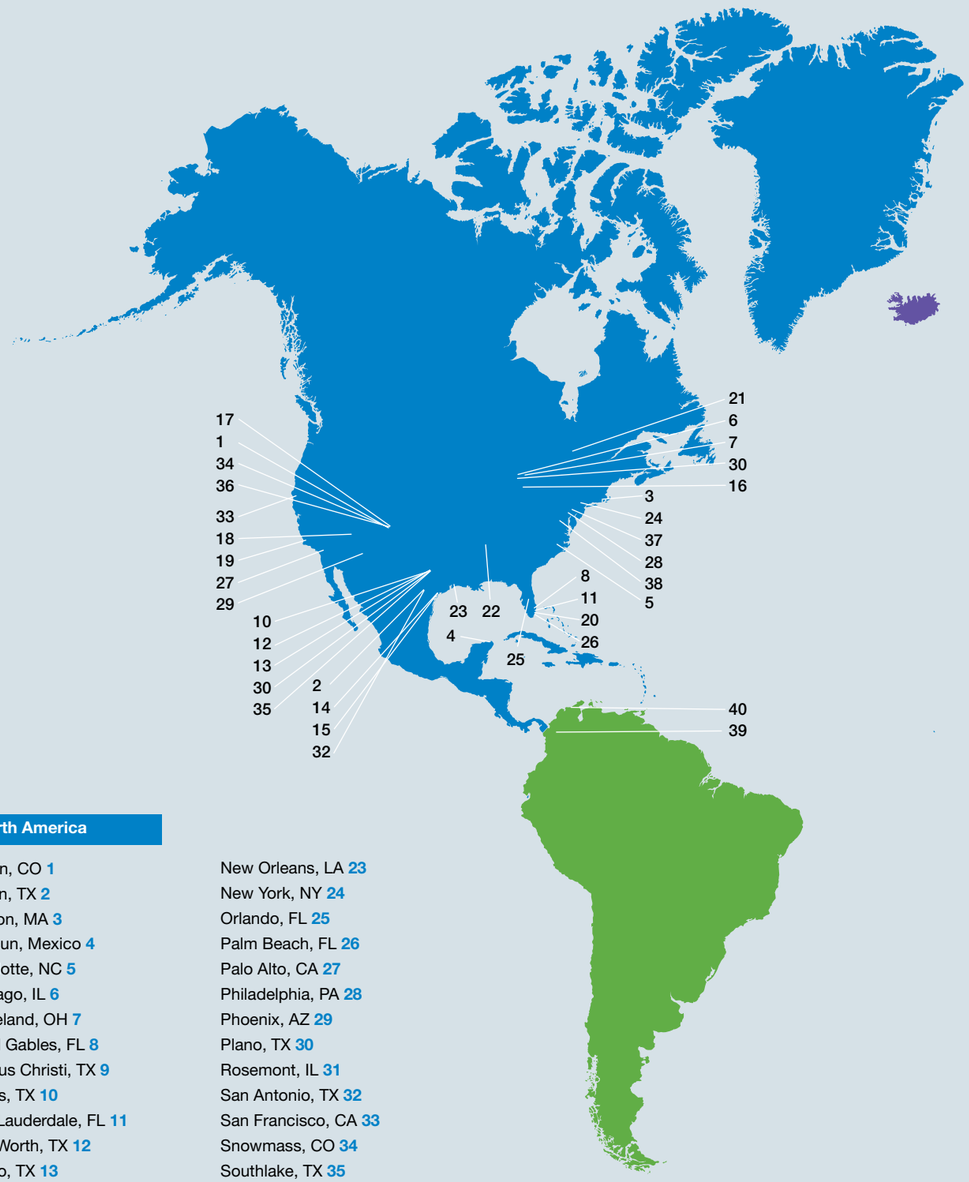
Background: While drill use is fundamental to orthopaedic surgery, the risk of plunging past the far cortex and potentially damaging surrounding soft tissues remains unavoidable with conventional drilling methods. A dual motor drill (DMD) may decrease that risk by providing controlled drill bit advancement and real-time monitoring of depth and energy expenditure. We hypothesized that using the dual motor drill would decrease plunge depth regardless of the user's level of experience.

Methods: Sixty-six subjects of varying operative experience (20 attending orthopaedic surgeons, 20 orthopaedic surgery residents, and 26 senior medical students) drilled three holes with a conventional drill (CD) and three holes with a DMD in a bicortical sawbone block set in ballistic gel. The depth of drill penetration into the ballistic gel was measured for each hole using a digital caliper.

Results: All subjects plunged less with the DMD than with the CD (0.9 mm vs. 4.2 mm, $p < 0.001$). This finding was consistent within each group: attendings (0.9 mm vs. 3.2 mm, $p = 0.02$), residents (1.0 mm vs. 3.0 mm, $p < 0.001$), and students (0.7 mm vs. 6.0 mm, $p < 0.001$). Plunge depths were also stratified into three categories: 0 to 2 mm, 2 to 5 mm, and > 5 mm. Using the DMD, subjects were more likely to plunge less than 2 mm (97% 0-2 mm vs. 3% 2-5 mm), whereas subjects were more likely to plunge deeper with the CD (27% 0-2 mm, 45% 2-5 mm, 27% > 5 mm). Notably, no subject plunged more than 2 mm on their third attempt with the DMD. Attending surgeons and residents plunged less than students with the CD ($p = 0.02$ and $p = 0.01$, respectively). There was no statistically significant difference between attendings and residents with the CD ($p = 0.96$). There was no statistically significant difference in plunge depth between groups using the DMD.

Conclusions: The DMD significantly decreased plunge depth for both surgically experienced and inexperienced subjects. While inexperienced subjects performed worse with the CD than those with experience, there was no difference in their performance with the DMD.

A Global Presence



North America

Aspen, CO 1
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Cancun, Mexico 4
Charlotte, NC 5
Chicago, IL 6
Cleveland, OH 7
Coral Gables, FL 8
Corpus Christi, TX 9
Dallas, TX 10
Fort Lauderdale, FL 11
Fort Worth, TX 12
Frisco, TX 13
Galveston, TX 14
Houston, TX 15
Indianapolis, IN 16
Keystone, CO 17
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Miramar, FL 20
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Phoenix, AZ 29
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Seoul, South Korea 60
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Australia

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Queenstown, New Zealand 65

Boes, Nathan, PGY-3

Can Combined Trans-Physeal and Lateral Extra-Articular Pediatric ACL Reconstruction Techniques Be Employed to Reduce ACL Re-Injury While Allowing for Growth?

Texas Orthopedic Association Annual Conf.; Houston, TX

Callan, Alexandra, Assistant Professor

Thirty-Day Readmission, Reoperation, and Mortality in Surgical Management of Metastatic Bone Disease of the Extremities

AAOS; Aspen, CO

Thirty-Day Readmission, Reoperation, and Mortality in Surgical Management of Metastatic Bone Disease of the Extremities

POSNA; New York, NY

Cherkashin, Alexander, Assistant Professor

New Approaches to Limb Lengthening and Deformity Correction in North America

The 4th Limb Reconstruction and Limb Correction Training Course; Tianjin, China

Malformaciones Congénitas

6º Curso Fijacíon Externa e Infecciones in Santa Marta; Santa Marta, Colombia

Preoperative Planning for External Fixation

9th UK Deformity Planning Course; Hull, UK

Computer Assisted Deformity Correction Using Hex-Ray

2018 Chicago Lower Extremity Surgical Symposium; Chicago, IL

How to Optimize External Fixation in Fragile Bones

Academic Super Week Congress in Medellin; Medellin, Colombia

Chung, Jane, Assistant Professor

Association Between Sleep Quality and Recovery Following Sport-Related Concussion in the Pediatric Population

American Academy of Pediatrics National Conference and Exhibition; Orlando, FL

Association Between Sleep Quality and Recovery Following a Sport-Related Concussion

Inaugural Traumatic Brain Injury Research Showcase, UTSW Brain Performance Institute; Dallas, TX

Cutler, Holt, PGY-2

Sources of Contamination in the Operating Room: A Fluorescent Particle Powder Study

Hip Society; New York, NY

Anconeus Approach to the Elbow (video submission)

OTA Annual Meeting Video Showcase; Orlando, FL

Del Core, Michael, PGY-4

Gender Differences of SF-36 Patient Reported Outcomes of Diabetic Foot Disease

WOA Annual Mtg.; Snowmass, CO

Comparison of Tension Band and Plate Fixation of Olecranon Fractures

WOA Annual Mtg.; Snowmass, CO

Intra-Operative Surgical Light Movement Is a Potential Source of Sterile Field Contamination

WOA Annual Mtg.; Snowmass, CO

Outcome of THR in HIV-Positive Patients Managed With Contemporary Protocols

TOA 2018; Fort Worth, TX

Ellis, Henry, Assistant Professor

Growth Plate Consideration: An Introduction to Pediatric Sports Medicine – an OITE Review

Baylor Orthopaedic Residency Guest Lecturer; Baylor

Snapping Hip: How to Deal With a Snapping Hip?

Texas Scottish Rite Pediatric Orthop Edu. Series; Dallas, TX

Principles of Management of Common Pediatric Sport Injuries

AAOS/POSNA; New Orleans, LA

Adolescent Hip Injuries

DFW Symposium; Southlake, TX

Apophyseal Avulsions: A Case-Base Discussion on Adolescent Pelvic Avulsion Fractures

Arthroscopy Association of North America 2018 Annual Meeting; Chicago, IL

Treatment of the First-Time Glenohumeral Dislocation in Athletes

Vail Shoulder Summit; Vail, CO

Surgical Considerations for Patellofemoral Instability in the Young Athlete

Texas Orthopaedic Association (TOA); Fort Worth, TX

Fracture of the Base of the 5th Metatarsal (the Jones Fracture)

Pediatric Orthopaedic Society of North America; Austin, TX

Hip Issues in the Young Athlete: Reducing the Risk of Injury

3rd Annual Sports Medicine for the Young Athlete; Frisco, TX

Fracture of the Base of the 5th Metatarsal (the Jones Fracture)

Pediatric Orthopaedic Society of North America; Chicago, IL

Why I Got Involved and Want a Leadership Position in the AAOS

National Orthopaedic Leadership Conference; Washington, DC

Sub-Muscular Plating for Pediatric Femur Fractures

AAOS/POSNA; Rosemont, IL

Meniscus Repair Techniques: All Inside, Inside Out, Outside In, and Root Repair

AAOS/POSNA; Rosemont, IL

Pediatric and Adolescent ACL Surgery: A Review of the Indications, Surgical Options, and Postoperative Management

Children's National Medical Center; Dallas, TX

Hip Issues in the Young Athlete: Reducing the Risk of Injury

Frisco Independent School District Athletic Trainer Inservice – Professional Day Development; Frisco, TX

The Iliotibial Band: Has the Pendulum Swung Back? A Look at the Historical and Current Use of the Iliotibial Band

George Washington University Grand Rounds; Washington, DC

Evaluating and Reporting Complications

George Washington University Grand Rounds; Washington, DC

Growth Plate Consideration: An Introduction to Pediatric Sports Medicine – an OITE Review

George Washington University Grand Rounds; Washington, DC

Pediatric Considerations in Common Sports Medicine Injuries

Children's National Medical Center; Washington, DC

Fairchild, Ryan, PGY-4

The Utility and Cost of Magnetic Resonance Imaging of the Knee in the Elderly Patients: A Cohort Study

MAOA; Miramar, FL

Pediatric Elbow Dislocations With a Concomitant Lateral Condylar Humerus Fracture

Society of Military Orthopaedic Surgeons Annual Mtg.; Keystone, CO

Predicting Mortality After Trauma Using Machine Learning Techniques and Electronic Medical Record Data

AAOS – Research Article; Las Vegas, NV

Pediatric Elbow Dislocations With a Concomitant Lateral Condylar Humerus Fracture

Orthopaedic Trauma Association; Orlando, FL

Gates, Stephen, PGY-4

Diagnostic Accuracy of the Scapular Retraction Test in Assessing the Status of the Rotator Cuff

TOA 2018; Fort Worth, TX

Diagnostic Accuracy of the Scapular Retraction Test in Assessing the Status of the Rotator Cuff

WOA Annual Mtg.; Snowmass, CO

Axillary and Radial Nerve Proximity to Latissimus Insertion: A Cadaveric Study

WOA Annual Mtg.; Snowmass, CO

Factors Predicting Re-Amputation After Transmetatarsal Amputation in Patients With Diabetes Mellitus

Orthopaedic Trauma Association; Orlando, FL

Anconeus Approach Video Technique

Orthopaedic Trauma Association; Orlando, FL

Herring, John, Professor

Controversies in the Classification of Legg-Calvé-Perthes (LCP)

International Pediatric Orthopaedic Think Tank; Queenstown, New Zealand

Amputation in the Management of Congenital Pseudarthrosis of the Tibia

Controversies in Pediatric Limb Reconstruction; Dallas, TX

Ho, Christine, Associate Professor

Common Pediatric Fractures

Orthopaedic Trauma Association; Orlando, FL

Are Patients Equally Satisfied With Advanced Practice Providers Compared to Surgeons in a Pediatric Fracture Clinic?

Orthopaedic Trauma Association; Orlando, FL

Salter Harris II Fractures of the Distal Femur: Does Displacement, Size of Thurston Holland Fragment, or Time to Surgery Affect Treatment or Risk of Complications?

American Academy of Pediatrics Annual Meeting; Orlando, FL

Are Open Distal Tibia Fractures More Severe Injuries Than Open Tibial Shaft Fractures in Children?

American Academy of Pediatrics Annual Meeting; Orlando, FL

Can We Estimate the Amount of Malrotation in Supracondylar Humerus Fractures After CRPP?

American Academy of Pediatrics Annual Meeting; Orlando, FL

Transphyseal Humeral Separations: What Can We Learn?

American Academy of Pediatrics Annual Meeting; Orlando, FL

Neuromuscular Conditions of the Upper Limb: Evaluation of the Upper Extremity in Arthrogryposis Mucopolysaccharoidosis in the Upper Extremity Radioulnar Synostosis Gradual Correction: Safer and More Powerful

International Pediatric Orthopaedic Symposium; Orlando, FL

Congenital Hand Challenges and Controversies in Pediatric Trauma: Upper Extremity Cases in Neuromuscular Conditions of the Upper Limb: Cerebral Palsy Congenital Cases and Trauma of the Upper Limb

International Pediatric Orthopaedic Symposium; Orlando, FL

Preoperative Diagnosis of Gartland Type IV Supracondylar Humerus Fractures: Substantial Overlap With Flexion-Type Fractures

AAOS – Research Article; Las Vegas, NV

Huo, Michael, Professor

Joint Arthroplasty Conference

Xiangshan International Conference; Hangzhou, China

Chinese Hip Society – American Association Hip and Knee Surgeons Combined Symposium

Annual Meeting of the Chinese Hip Society; Guiyang, China

Outcome of THR in HIV-Positive Patients Managed With Contemporary Protocols

AAOS; New Orleans, LA

Instructional Complex Source

Annual G.W.N. Eggers Alumni Conference; Galveston, TX

Outcome of THR in HIV-Positive Patients Managed With Contemporary Protocols

MAOA; San Antonio, TX

AORecon Principles Course

Beijing, China

AORecon Principles Course

Chengdu, China

AORecon Principles Course

Seoul, South Korea

Outcome of THR in HIV-Positive Patients Managed With Contemporary Protocols

WOA Annual Mtg.; Snowmass, CO

Correlation of Initial Fit of the Tapered Stem-to-Stem Subsidence in Revision THR

WOA Annual Mtg.; Snowmass, CO

Guangzhou Hip Revision Forum

2018 Guangzhou Forum; Guangzhou, China

Symposium on Infection

SICOT Annual Meeting; Montreal, Canada

Symposium on New Technology in Joint Arthroplasty

Arthroplasty Society in Asia; Shanghai, China

Symposium on Infection and Peri-Prosthetic Fractures

Chinese Orthopaedic Association Annual Mtg.; Xiamen, China

Complex Course

AORecon Complex Course; Davos, Switzerland

AORecon Principles Course

Webinar on Practical Exercises; Davos, Switzerland

Karol, Lori, Professor

Early Onset Scoliosis: Why We Don't Do What We Used to Do, and What We Do Now

Eugene E. Bleck, M.D. Visiting Professorship, Stanford University; Palo Alto, CA

Gait and Function in Patients With Clubfoot; Pediatric Amputee Gait; The Analysis of Scoliosis Patients in the Movement Science Laboratory; Leaving the Lab: What Can We Learn?

Shirley Ryan Ability Lab Visiting Professorship, Northwestern University; Chicago, IL

Evidence-Based Treatment of Congenital Pseudarthrosis of the Tibia; Technique: The McFarland Bypass Graft; Office Tenotomy: How I Do It; Casting in Congenital Vertical Talus: What Can We Get

International Pediatric Orthopaedic Symposium; Orlando, FL

Khazzam, Michael, Associate Professor

Is There a Role for Polymerase Chain Reaction/Next Generation Sequencing (PCR/NGS) Technique in the Diagnosis of Shoulder Periprosthetic Joint Infection (PJI)?

2nd International Consensus Meeting on Musculoskeletal Infection; Philadelphia, PA

Should Shoulder Bone Graft or Cement Be Removed During Treatment of Acute Shoulder Periprosthetic Joint Infection (PJI)?

2nd International Consensus Meeting on Musculoskeletal Infection; Philadelphia, PA

Should Shoulder Bone Graft or Cement Be Removed During Treatment of Subacute or Chronic Shoulder Periprosthetic Joint Infection (PJI)?

2nd International Consensus Meeting on Musculoskeletal Infection; Philadelphia, PA

Is There a Role for Irrigation and Debridement (I&D) With Implant Retention When Treating Acute Periprosthetic Joint Infection (PJI)?

2nd International Consensus Meeting on Musculoskeletal Infection; Philadelphia, PA

Kim, Harry, Professor

My Treatment Concepts in Perthes

Legg-Calvé-Perthes Symposium; Aarhus, Denmark

Close Reduction and Spica Cast Treatment for DDH (6 months to 2 years); Assessment and Management of Residual Acetabular Dysplasia; Complications and Pitfalls of DDH Treatment

5th China-TSRH Orthopaedic Surgeons Association Annual Meeting; Beijing, China

From What to Why: Experimental Studies on Legg-Calvé-Perthes Disease; Advances in Diagnostic Imaging and Management of Legg-Calvé-Perthes Disease

University Hospital, Cleveland Medical Center; Cleveland, OH

Research in Orthopaedic Surgery, How to Write a Research Grant; Perthes Disease: Management of the Non-Containable Hip, Investigational Techniques to Improve Femora Head Sphericity; Genetics and Basic Research, Advances in Perthes Disease Research and Discoveries; Janus Session, Perthes Disease Marching Forward

Silver Jubilee Conference of Pediatric Orthopaedic Society of India; Mumbai, India

Imaging Perthes Disease: State of the Art

Controversies in Pediatric Limb Reconstruction Symposium; Dallas, TX

Lalli, Trapper, Assistant Professor

Quality of Life in Diabetic Foot Disease

Southern Orthopaedic Association Extremity Summit; White Sulphur Springs, WV

Quality of Life in Diabetic Foot Disease

WOA Annual Mtg.; Snowmass, CO

Large-Scale Retrospective Cohort Study of Post-Operative Complications Following Ankle Fracture Surgery in Patients With Diabetes Mellitus

Diabetic Foot Study Group; Berlin, Germany

Liu, George, Associate Professor

Joint Depression Fractures of the Calcaneus: Are We Really Making a Difference?

Western Pennsylvania Hospital Scott Alter Memorial Lecture Series, Selected Topics in Foot & Ankle Surgery #4; Pennsylvania

Distal Tibiofibular Syndesmosis Injuries: Why We Miss the Acute and How We Let Them Become Chronic

Western Pennsylvania Hospital Scott Alter Memorial Lecture Series, Selected Topics in Foot & Ankle Surgery #4; Pennsylvania

Charcot Arthropathy: Does It Matter What I Do?

Western Pennsylvania Hospital Scott Alter Memorial Lecture Series, Selected Topics in Foot & Ankle Surgery #4; Pennsylvania

Posterior Malleolar Ankle Fractures: Why Are We Trying To Fix Them All?

Western Pennsylvania Hospital Scott Alter Memorial Lecture Series, Selected Topics in Foot & Ankle Surgery #4; Pennsylvania

Pardon My Interruption –Trauma Version (Panelist)

American College of Foot and Ankle Surgeons 76th Annual Scientific Conference; Nashville, TN

Syndesmotic Instability: Pre- and Intra-Operative Assessment

American College of Foot and Ankle Surgeons 76th Annual Scientific Conference; Nashville, TN

Syndesmotic Malreductions

American College of Foot and Ankle Surgeons 76th Annual Scientific Conference; Nashville, TN

3-Dimensional Computed Tomographic Characterization of Normal Anatomic Morphology of the Distal Tibiofibular Syndesmosis

American College of Foot and Ankle Surgeons 76th Annual Scientific Conference; Nashville, TN

Foot and Ankle Anatomy: Structure, Function, Clinical Correlations

PM&R Resident Anatomy Cadaver Course; Dallas, TX

Ankle Fracture That Everyone Wants to Run From

Diabetic Limb Salvage, Georgetown University Hospital; Washington, DC

Calcaneal Fractures: Has the Limited Approach Provided the Outcomes We Hoped?

Texas Podiatric Medical Association Annual Meeting; Galveston, TX

4th and 5th Metatarsocuboid Degenerative Joint Disease

Texas Podiatric Medical Association Annual Meeting; Galveston, TX

Gender Differences of SF-36 Patient Reported Outcomes of Diabetic Foot Disease

SOA; Palm Beach, FL

Comparison of Tension Band & Plate Fixation of Olecranon Fractures

WOA Annual Mtg.; Snowmass, CO

Large-Scale Retrospective Cohort Study of Post-Operative Complications Following Ankle Fracture Surgery in Patients With Diabetes Mellitus

Diabetic Foot Study Group; Berlin, Germany

Distal Tibiofibular Syndesmosis Injuries: Why We Miss the Acute and How We Let Them Become Chronic

4th Scientific Meeting of Asia-Pacific Society of Foot and Ankle Surgeons; Nanjing, China

Posterior Malleolar: Should We Be Fixing Them All or Not at All?

Texas Podiatric Medical Association, Southwestern Foot and Ankle Conference; Dallas, TX

McIntosh, Amy, Associate Professor

Developmental Hip Dysplasia: How to Stay Out of Trouble

POES; Dallas, TX

POSNA Pediatric Spinal Deformity: Diagnosis and Management in 2018

MAGEC; Dallas, TX

Size Matters: Which Adolescent Patients Are Most Likely to Require Surgical Decompression for Lumbar Disk Herniations?

TOA; Fort Worth, TX

Post-Operative Oxygen Consumption: Growing Rod Graduates vs. Adolescent Idiopathic Scoliosis

MAOA; San Antonio, TX

Significant Reductions in Surgical Site Infection (SSI) in Spinal Fusion Patients Using a Bundled Intervention Approach

MAOA; San Antonio, TX

TLSO All the Time vs. Nighttime Bracing Only (Invited)

POSNA Spine Subspecialty Day; Dallas, TX

Two AIS Spine Surgeries on the Same Day by the Same Surgeon: Is Performance and Outcome the Same?

IMAST; Los Angeles, CA

Consensus-Based Practice Guidelines (BPG) for Use of Preoperative Halo Gravity Traction (HGT) for Pediatric Spinal Deformity

International Congress on Early Onset Scoliosis; Lisbon, Portugal

The Use of Halo Gravity Traction in the Treatment of Severe Early Onset Scoliosis

International Congress on Early Onset Scoliosis; Lisbon, Portugal

Does Mehta Casting Work in Patients With Infantile Onset Scoliosis and Intrathecal Abnormalities?

International Congress on Early Onset Scoliosis; Lisbon, Portugal

How Do We Optimize Comprehensive Care in EOS Nutritional Status?: Management of the Fluffy ICEOS

International Congress on Early Onset Scoliosis; Lisbon, Portugal

Musculoskeletal Infection: Best Imaging Modality

International Pediatric Orthopaedic Symposium; Orlando, FL

Calcaneonavicular Coalitions

International Pediatric Orthopaedic Symposium; Orlando, FL

Maintenance of Certification (MOC) Lower Extremity Deformity

International Pediatric Orthopaedic Symposium; Orlando, FL

Size Matters: Which Adolescent Patients Are Most Likely to Require Surgical Decompression for Lumbar Disk Herniations?

European Pediatric Orthopaedic Society (EPOS); Oslo, Norway

Miller, Shane, Associate Professor

Gender Differences In Same-Day Return to Play Following Concussion

Pediatric Research in Sports Medicine; Fort Lauderdale, FL

Association Between Sleep Quality and Concussion Symptoms in the Pediatric Population

Pediatric Research in Sports Medicine; Fort Lauderdale, FL

Trends in Football-Related Concussions Presenting to a Pediatric Sport-Related Concussion

Pediatric Research in Sports Medicine; Fort Lauderdale, FL

Promoting Access and Wellness in a Large Metropolitan Area Through Adaptive Sports and Recreation

20th Annual Rehabilitation Psychology Conference; Dallas, TX

Brachial Plexus Injuries: Burners/Stingers

15th Annual DFW Sports Medicine Symposium; Southlake, TX

Are Laws and Guidelines Enough to Prevent Same-Day Return to Play?

American Medical Student Association; Washington, DC

Helmets and Rule Changes: Can We Prevent Concussions?

Texas Scottish Rite Hospital for Children, Sports Medicine Center; Frisco, TX

Sports Medicine for the Young Athlete: How Do We Keep Our Kids Safe?

Texas Scottish Rite Hospital for Children, Sports Medicine Center; Frisco, TX

Foot and Ankle Injuries in the Young Athlete

Driscoll 24th Annual Pediatric Conference; Corpus Christi, TX

Implications of Playing After the Injury & Concussion Prevention

The Concussion Health Summit; Southlake, TX

Spine Injuries

Sports Medicine Outreach, UT Southwestern; Dallas, TX

Why Do Pediatric Athletes Continue to Play Following Concussion?

American Academy of Neurology; Indianapolis, IN

Docosahexaenoic Acid (DHA) for the Treatment of Pediatric Sport-Related Concussion

American Academy of Pediatrics; Orlando, FL

Inside the Pediatric Athlete's Mind: Why They Continue to Play Following a Concussion

American Academy of Pediatrics; Orlando, FL

Playing With Acute Fractures & Return to Play After Stress Fracture

American Academy of Pediatrics; Orlando, FL

Docosahexaenoic Acid (DHA) for the Treatment of Pediatric Sport-Related Concussion: Results of a Feasibility Trial

Inaugural TBI Research Showcase; Dallas, TX

Podeszwa, David, Associate Professor

Indications for Acute vs. Gradual Deformity Correction

Chinese Pediatric Orthopaedic Society – Texas Scottish Rite Hospital 5th Annual Meeting; Qingdao, China

Complications of External Fixation

Chinese Pediatric Orthopaedic Society – Texas Scottish Rite Hospital 5th Annual Meeting; Qingdao, China

External Fixation: Past, Present, and Future

Chinese Pediatric Orthopaedic Society – Texas Scottish Rite Hospital 5th Annual Meeting; Qingdao, China

Evaluation and Treatment of Sagittal Plane Deformities

Chinese Pediatric Orthopaedic Society – Texas Scottish Rite Hospital 5th Annual Meeting; Qingdao, China

Physeal Bar Resection: TSRH Experience and Treatment Recommendations

Chinese Pediatric Orthopaedic Society – Texas Scottish Rite Hospital 5th Annual Meeting; Qingdao, China

Raspovic, Katherine, Assistant Professor

Scoring Mental Health Quality of Life with the SF-36 in Patients With and Without Diabetes Foot Complications

American College of Foot and Ankle Surgeons Annual Scientific Conference; Nashville, TN

Greatest Feared Complications in Patients With Diabetic Foot Disease: An Expanded Follow-Up Study

American College of Foot and Ankle Surgeons Annual Scientific Conference; Nashville, TN

Effectiveness of Viable Cryopreserved Placental Membranes for Management of Diabetic Foot Ulcers in a Real-World Setting

SAWC Spring Meeting; Charlotte, NC

Bone Biopsy: Can We Rely on It?

Texas Podiatric Medical Association; Galveston, TX

Hallux Valgus-Distal vs. Proximal: Is One More Superior Than the Other?

Texas Podiatric Medical Association; Galveston, TX

Tendoachilles Lengthening for Forefoot Ulcers

Texas Podiatric Medical Association; Galveston, TX

Plastic Surgery Techniques for Foot and Ankle Coverage Options

Diabetic Foot Study Group Meeting of the European Association for the Study of Diabetes; Berlin, Germany

Factors Predicting Re-Amputation After Transmetatarsal Amputation in Patients With Diabetes Mellitus

Diabetic Foot Study Group Meeting of the European Association for the Study of Diabetes; Berlin, Germany

Early Results of the Anconeus Approach to the Elbow

POSNA, AAOS, Visiting Prof, MSTS; New York, NY

Comprehensive Evaluation of the Infected Diabetic Foot

Texas Podiatric Medical Association Annual Southwest Podiatric Conference; San Antonio, TX

Plastic Surgery Techniques for Foot and Ankle Coverage Options

Texas Podiatric Medical Association Annual Southwest Podiatric Conference; Dallas, TX

Metaphyseal Fracture Displacement Is Predictive of Intra-Articular Diastasis in Adolescent Triplane Ankle Fractures

60th Annual Meeting of the Society of Military Orthopaedic Surgeons; Keystone, CO

Forefoot Procedures to Heal and Prevent Ulcers

Texas Podiatric Medical Association; San Antonio, TX

When to Consider an Ostectomy for the Charcot Midfoot Ulcer

Texas Podiatric Medical Association; San Antonio, TX

Riccio, Anthony, Associate Professor

Comparative Performance of Conventional Drills and Drills With Controlled Advancement and Real-Time Feedback

27th Annual Meeting of the Limb Lengthening and Reconstruction Society; San Francisco, CA

Splinting and Casting Pediatric Patients

American Academy of Pediatrics National Conference; Orlando, FL

Can Real-Time Monitoring With a Controlled Advancement Drill Decrease Plunge Depth?

60th Annual Meeting of the Society of Military Orthopaedic Surgeons; Keystone, CO

Pediatric Elbow Dislocations With a Concomitant Lateral Condylar Humerus Fracture

60th Annual Meeting of the Society of Military Orthopaedic Surgeons; Keystone, CO

Complications After Pelvic Arteriography in Patients With Pelvic Ring Disruptions

37th Annual Meeting of the European Bone and Joint Infection Society; Helsinki, Finland

Sammer, Douglas, Associate Professor

Soft Tissue Tumors

American Association of Hand Surgeons (AAHS); Phoenix, AZ

Collagenase in the Management of Dupuytren's Contracture

American Society for Surgery of the Hand (ASSH); Boston, MA

Intrinsic Flaps in the Hand

American Society for Surgery of the Hand (ASSH); Boston, MA

Replant Revisited

American Society of Plastic Surgeons; Chicago, IL

Dupuytren's Contracture

American Society of Plastic Surgeons; Chicago, IL

Sanders, Drew, Assistant Professor

Efficacy and Safety of Percutaneous Reduction and Sacroiliac Screw Placement: A Review of Pediatric Patients at a Single Institution

AAOS Annual Meeting; New Orleans, LA

Comparison of Complications, Reoperations, and Outcomes Between Tension Band Wiring and Plate Fixation in Olecranon Fractures

Western Orthopaedic Association; Snowmass, CO

Early Results of the Anconeus Approach to the Elbow

OTA; Orlando, FL

Sathy, Ashoke, Associate Professor

Complications After Pelvic Angiography in Patients With Pelvic Ring Disruptions

36th Annual Meeting MAOA; San Antonio, TX

Early Results of the Anconeus Approach to the Elbow. Video Technique

34th Annual Meeting of Orthopaedic Trauma Association Video Showcase; Orlando, FL

The Anconeus Approach to the Elbow

34th Annual Meeting of Orthopaedic Trauma Association Video Showcase; Orlando, FL

Thirty-Day Readmission, Reoperation, and Mortality in Surgical Management of Metastatic Bone Disease of the Extremities

Podiatric Medical Association Diabetic Foot Update; San Antonio, TX

Forefoot Procedures to Heal and Prevent Ulcers

Texas Podiatric Medical Association Diabetic Foot Update; San Antonio, TX

Can Inflammatory Biomarkers Identify Patients at Higher Risk of Lower Extremity Amputation?

37th Annual Meeting of the European Bone and Joint Infection Society; Helsinki, Finland

Diagnostic Utility of Erythrocyte Sedimentation Rate and C-Reactive Protein in Osteomyelitis of the Foot in Persons Without Diabetes

15th Annual Meeting of the Diabetic Foot Study Group; Berlin, Germany

Schell, Benjamin, PGY-5

Patient-Reported Outcomes in Patients With Shoulder Adhesive Capsulitis

MAOA; San Antonio, TX

Shah, Jay, Assistant Professor

ISAKOS Classification of Meniscus Tears: Arthroscopic Correlations With MRI

12th Biennial Congress of the International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine; Cancun, Mexico

Sucato, Daniel, Professor

Cases and Complications in the Immature Hip: Salvage Procedures and Managing Hing Abduction

15th Annual IPOS Conference; Orlando, FL

POPS Presents – Perioperative Management of the CP Patient: QSVI: Small Measures, Big Impact

15th Annual IPOS Conference; Orlando, FL

Hip Conditions in the Older Child and Adolescent: Acute Unstable: What Should We Do?

15th Annual IPOS Conference; Orlando, FL

Authors' Preferred Techniques: Proximal Femoral Osteotomy After Prior SCFE In Situ Pinning

15th Annual IPOS Conference; Orlando, FL

Spine: Spondylolysis and Spondylolisthesis: Surgical Treatment of High-Grade Slip

15th Annual IPOS Conference; Orlando, FL

Patient and Provider Wellness: QSVI

15th Annual IPOS Conference; Orlando, FL

Adolescent Idiopathic Scoliosis: Bracing Indications and Outcomes

Silver Jubilee Conference of Pediatric Orthopaedic Society of India; India

Adolescent Idiopathic Scoliosis: Minimizing Complications; Focus on Safety

Silver Jubilee Conference of Pediatric Orthopaedic Society of India; India

Advanced Pelvic Osteotomies: Periacetabular Osteotomy – Indications and Technique

Silver Jubilee Conference of Pediatric Orthopaedic Society of India; India

Perthes Disease – Management of the Non-Containable Hip; Femoral Head Reshaping by Surgical Hip Dislocation

Silver Jubilee Conference of Pediatric Orthopaedic Society of India; India

Save the Head Symposium – Pelvic Procedures

Silver Jubilee Conference of Pediatric Orthopaedic Society of India; India

You Are Both Wrong: Tethering Has No Role in 2019

PSD On the Cutting Edge VII; Coral Gables, FL

Lessons Learned From My Most Challenging Lumbosacral Congenital Anomaly Case

PSD On the Cutting Edge VII; Coral Gables, FL

My Most Challenging NM/Exotic Deformity – Case Discussion

PSD On the Cutting Edge VII; Coral Gables, FL

Derotation Techniques for AIS Patients, Support by Globus

PSD On the Cutting Edge VII; Coral Gables, FL

Tietze, David, Assistant Professor

Evaluation of Sports Medicine Musculoskeletal Curriculum for Internal Medicine Residents

American Medical Society for Sports Medicine Conf.; Houston, TX

An Unusual Presentation of Shoulder Pain

American Medical Society for Sports Medicine Conf.; Houston, TX

Literature Review on Treatment Options for Neurogenic Quadrilateral Space Syndrome

American Medical Society for Sports Medicine Conf.; Houston, TX

Van Hal, Michael, Assistant Professor

The Surgical Learning Curve of Orthopaedic Spine Surgeons

Women in Science and Medicine Poster Session; Dallas, TX

VanPelt, Michael, Associate Professor

Greatest Feared Complications in Patients With Diabetic Foot Disease: An Expanded Follow-Up Study

TPMA Southwest Foot & Ankle Conference; Nashville, TN

Scoring Mental Health Quality of Life With the SF-36 in Patients With and Without Diabetes Foot Complications

TPMA Southwest Foot & Ankle Conference; Nashville, TN

3-Dimensional Computed Tomographic Characterization of Normal Anatomic Morphology of the Distal Tibiofibular Syndesmosis

TPMA Southwest Foot & Ankle Conference; Nashville, TN

Ankle Fracture Cadaver Workshop

TPMA Southwest Foot & Ankle Conference; Nashville, TN

To Fix or Not to Fix … Isolated Malleolar Fracture

TPMA Southwest Foot & Ankle Conference; Nashville, TN

Osteobiologics – What Works? PRP

TPMA Southwest Foot & Ankle Conference; Nashville, TN

ABFAS Board Certification Discussion

TPMA Southwest Foot & Ankle Conference; Frisco, TX

Moderator for Complex Pediatric Discussion

TPMA Southwest Foot & Ankle Conference; Frisco, TX

Moderator for Request and New Innovations

TPMA Southwest Foot & Ankle Conference; Frisco, TX

Wallace, Stephen, PGY-4

Can Real-Time Monitoring With Dual Motor Drill Decrease Plunge Depth?

Brandon Carrell Visiting Professorship; Dallas, TX

Clinic and Radiographic Outcomes of Femoral Head Fractures Associated With Traumatic Hip Dislocations

WOA 2018; Snowmass, CO

Ipsilateral Femoral Neck and Shaft Fractures – One or Two Devices?

Clinical Orthopaedic Society; Austin, TX

Wells, Joel, Assistant Professor

Host Responses to Bulk and Particulate Titanium

UTSW Medical Center Research Day; Dallas, TX

Do Active PAO Patients Maintain Their Activity Levels Over Mid- to Long-Term Follow-Ups?

AAHKS Annual Mtg.; Dallas, TX

Sleep Quality in Patients With Osteoarthritis of the Hip

13th Congress of the European Hip Society; The Hague, Netherlands

Sleep Quality in Patients With Femoroacetabular Impingement and Acetabular Dysplasia of the Hip

ISHA; Melbourne, Australia

Wilson, Philip, Associate Professor

Return to Play Clearance in Adolescents Following Anterior Cruciate Ligament Reconstruction: Considerations of the Contralateral Extremity

PRISM; Fort Lauderdale, FL

Anatomy vs. Activity: A Comparison of Capitellar Osteochondritis Dissecans in Gymnasts and Baseball Players

PRISM; Fort Lauderdale, FL

Identifying Youth Athletes at Risk for Failure to Return to Play Following ACL Reconstruction Force

PRISM; Fort Lauderdale, FL

Quadriceps and Rectus Tendon Relationship – Concerns for Rectus Tendon Injury During Quad Tendon Harvest in Pediatric Patients

PRISM; Fort Lauderdale, FL

Fast Fix Penetration – Neurovascular Injury During Meniscus Repair

PRISM; Fort Lauderdale, FL

Significance of Radiographic Correlates and Hip Rotation in a Prone and Supine

PRISM; Fort Lauderdale, FL

Developmental Anatomy of the Meniscus in the Skeletally Immature

PRISM; Fort Lauderdale, FL

Descriptive Anatomy of the Pediatric Quadriceps Tendon: Implications for ACL Autograft Repair

PRISM; Fort Lauderdale, FL

Shoulder Instability Course Moderator

Pediatric Research in Sports Medicine Society; Fort Lauderdale, FL

ACL Deficiency in the Immature Athlete

TSRH Pediatric Orthopaedic Conference; Dallas, TX

Joint Preservation in the Pediatric and Adolescent Knee

AAOS; New Orleans, LA

Injury Prevention and the ACL Young Athlete

TSRH SMYA; Frisco, TX

Anatomy vs. Activity: A Comparison of Captellar Osteochondritis Dissecans in Gymnasts and Baseball Players

POSNA; Austin, TX

Quadriceps and Rectus Tendon Relationship – Concerns for Rectus Tendon Injury During Quad Tendon Harvest in Pediatric Patients

POSNA; Austin, TX

Fast Fix Penetration – Neurovascular Injury During Meniscus Repair

POSNA; Austin, TX

Descriptive Anatomy of the Pediatric Quadriceps Tendon: Avoiding Deep Quad Muscle Weakness After Graft Harvest for ACL

POSNA; Austin, TX

Distal Patellofemoral Realignment

AAOS/POSNA; Plano, TX

Hamstring Harvests and All-Epiphyseal Reconstruction Techniques

AAOS/POSNA; Plano, TX

Distal Patellofemoral Realignment

AAOS/POSNA Pediatric Sports and Trauma; Rosemont, IL

Distal Patellofemoral Realignment

Lower Extremity Trauma Moderator; Rosemont, IL

Knee Arthroscopy Session Moderator

Lower Extremity Trauma Moderator; Rosemont, IL

Wukich, Dane, Professor

The Surgical Management of Charcot Neuroarthropathy

The 17th Malvern Diabetic Foot Conference; Malvern, England

Charcot Neuroarthropathy: Diagnosis and Treatment

First Gan-Po International Endocrinology-Metabolism Forum; Nanchang, China

Offloading for the Diabetic Foot

First Gan-Po International Endocrinology-Metabolism Forum; Nanchang, China

Advanced Techniques in Charcot Reconstruction: Internal Fixation Is My Proven Technique for the Hindfoot and Ankle

Joint 4th Association of Diabetic Foot Surgeons and King's College Charcot Foot Reconstruction Symposium; London, England

What Do Patients With Charcot Neuroarthropathy Fear? Joint 4th Association of Diabetic Foot

Surgeons and King's College Charcot Foot Reconstruction Symposium; London, England

Diagnostic Utility of Erythrocyte Sedimentation Rate and C-Reactive Protein in Osteomyelitis of the Foot in Persons Without Diabetes

37th Annual Meeting of the European Bone and Joint Infection Society; Helsinki, Finland

Can Inflammatory Biomarkers Identify Patients at Higher Risk of Lower Extremity Amputation?

37th Annual Meeting of the European Bone and Joint Infection Society; Helsinki, Finland

Increased Rates of Readmission, Reoperation, and Mortality Following Open Reduction and Internal Fixation of Ankle Fractures Are Associated With Diabetes Mellitus

15th Annual Meeting of the Diabetic Foot Study Group; Berlin, Germany

Factors Predicting Re-Amputation After Transmetatarsal Amputation in Patients With Diabetes Mellitus

15th Annual Meeting of the Diabetic Foot Study Group; Berlin, Germany

Lower-Extremity Amputation and Mortality in Diabetic and Non-Diabetic Patients With Necrotizing Fasciitis

15th Annual Meeting of the Diabetic Foot Study Group; Berlin, Germany

Risk Factors for Unplanned Above-Knee Amputation After Initial Transtibial Amputation in the Perioperative Period

15th Annual Meeting of the Diabetic Foot Study Group; Berlin, Germany

Increased Rates of Readmission, Reoperation, and Mortality Following Open Reduction and Internal Fixation of Ankle Fractures Are Associated With Diabetes Mellitus

4th Asian Pacific Foot and Ankle Society Meeting; Nanjing, China

Multiplanar Deformity in Hallux Valgus

4th Asian Pacific Foot and Ankle Society Meeting; Nanjing, China

Diagnosis and Treatment of Charcot Neuroarthropathy

The Diabetic Foot Update; San Antonio, TX

Complications After DM Ankle Fractures Recurrence

The Diabetic Foot Update; San Antonio, TX

When to Decide Between Amputation vs. Limb Salvage

The Diabetic Foot Update; San Antonio, TX

Correcting Complex Foot and Ankle Deformities to Heal and Ulcer

The Diabetic Foot Update; San Antonio, TX

Young, Tyler, PGY-2

Early Results of the Anconeus Approach to the Elbow

Orthopaedic Trauma Association; Orlando, FL

Zhang, Andrew, Associate Professor

Comparing Strength of Muscle Laceration Repairs Using Various Suture Techniques

Texas Society of Plastic Surgeons; San Antonio, TX

Fibroma of Tendon Sheath With Digital Neuropathy

Texas Society of Plastic Surgeons; San Antonio, TX

Callan, Alexandra, Assistant Professor

Conventional MR and Diffusion-Weighted Imaging of Musculoskeletal Soft Tissue Malignancy: Correlation With Histologic Grading

European Radiology

Cherkashin, Alexander, Assistant Professor

Treatment Strategies and Frame Configurations in the Management of Foot and Ankle Deformities

Clinics in Podiatric Medicine and Surgery

Copley, Lawson, Professor

Differentiation of Deep Venous Thrombosis Among Children With or Without Osteomyelitis

J Pediatric Orthopaedics

Severity Adjusted Risk of Long-Term Adverse Sequelae Among Children With Osteomyelitis

Pediatric Infectious Disease Journal

Cutler, Holt, PGY-2

Trifurcate Origin of Long Head of Biceps Brachii: A Case Report and Literature Review

J Orthopaedic Case Reports

Del Core, Michael, PGY-4

The Evaluation and Treatment of Diabetic Foot Ulcers and Diabetic Foot Infections

Foot & Ankle Orthopaedics

Unplanned Above-Knee Amputation After Initial Below-Knee Amputation in the 30-Day Postoperative Period

J Physical Medicine Rehabilitation

Clinical and Radiographic Outcomes of Femoral Head Fractures Associated With Traumatic Hip Dislocations

Strategies in Trauma and Limb Reconstruction

Ellis, Henry, Assistant Professor

Patellofemoral Instability in the Skeletally Immature Patient: A Review and Technical Description of Medial Patellofemoral Ligament Reconstruction in Patients With Open Physes

American J Orthopaedics

The Importance of a Standardized Screening Tool to Identify Thromboembolic Risk Factors in Pediatric Lower Extremity Arthroscopy Patients

J American Academy Orthopaedic Surgery

The Influence of Major Depressive Disorder at Both the Preoperative and Postoperative Evaluations for Total Knee Arthroplasty Outcomes

Pain Medicine

Ezaki, Marybeth, Clinical Professor

Macrodactyly: Decision-Making and Surgery Timing

J Hand Surgery European Volume

Gates, Stephen, PGY-4

Surgically Relevant Anatomy of the Axillary and Radial Nerves in Relation to the Latissimus Dorsi Tendon in Variable Shoulder Positions: A Cadaveric Study

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Heidari, Soraya, PGY-1

Discharge Destination After Shoulder Arthroplasty: An Independent Risk Factor for Readmission and Complications

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Fibular Groove Morphology and Measurements on MRI: Correlation With Fibularis Tendon Abnormalities

Surgical and Radiological Anatomy

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J Pediatric Orthopaedics

Herring, John, Professor

Genome-Wide Meta-Analysis and Replication Studies in Multiple Ethnicities Identify Novel Adolescent Idiopathic Scoliosis Susceptibility Loci

Human Molecular Genetics

Ho, Christine, Associate Professor

Soft Tissue Injury Severity Is Associated With Neurovascular Injury in Pediatric Supracondylar Humerus Fractures

J Pediatric Orthopaedics

Huo, Michael, Professor

Multi-Parametric Muscle and Fat Correlation of Computed Tomography Parameters to Outcomes in a Total Hip Arthroplasty Population

BMC Musculoskeletal Disorders

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J Knee Surgery

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J Anatomy

Johnston, Charles, Professor

Recurrence After Surgical Intervention for Infantile Tibia Vara: Assessment of a New Modified Classification

J Pediatric Orthopaedics

Karol, Lori, Professor

Clubfoot Does Not Impair Gross Motor Development in 5-Year-Olds

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Gross Motor Function at 10 Years of Age in Children With Clubfoot Following the French Physical Therapy Method and the Ponseti Technique

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Functional Outcomes Following Treatment for Clubfoot: 10 Year Follow-Up

J Bone Joint Surgery America

The Natural History of Early Onset Scoliosis

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Khaleel, Mohammed, Assistant Professor

Magnetic Resonance Neurography in Chronic Lumbosacral and Pelvic Pain: Diagnostic and Management Impact-Institutional Audit

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Magnetic Resonance Neurography of the Lumbosacral Plexus in Failed Back Surgery Syndrome

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Khazzam, Michael, Associate Professor

Bactericidal Efficacy of Hydrogen Peroxide on Cutibacterium Acnes

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Biomechanical Evaluation of Location and Mode of Failure in Three Screw Fixations for a Comminuted Transforaminal Sacral Fracture Model

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Diagnostic Accuracy of the Scapular Retraction Test in Assessing the Status of the Rotator Cuff

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Latissimus Dorsi Tendon Rupture

J American Academy Orthopaedic Surgery

Kim, Harry, Professor

Treatment Patterns and Outcomes of Stable Hips in Infants With Ultrasonic Dysplasia

J American Academy Orthopaedic Surgery

Quantitative Susceptibility Mapping Detects Neovascularization of the Epiphyseal Cartilage After Ischemic Injury in a Piglet Model of Legg-Calvé-Perthes Disease

J Magnetic Resonance Imaging

IL6 Receptor Blockade Preserves Articular Cartilage and Increases Bone Volume Following Ischemic Osteonecrosis in Immature Mice

Osteoarthritis Cartilage

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Quantitative MRI Helps to Detect Hip Ischemia: Preclinical Model of Legg-Calvé-Perthes Disease

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Ionic Silicon Improves Endothelial Cells' Survival Under Toxic Oxidative Stress by Overexpressing Angiogenic Markers and Antioxidant Enzymes

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Koehler, Daniel, Assistant Professor

Endoscopic vs. Open Carpal Tunnel Release: A Detailed Analysis Using Time-Driven Activity-Based Costing at an Academic Medical Center

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Lavery, Lawrence, Professor

Complications During the Treatment of Diabetic Foot Osteomyelitis

Diabetes Research and Clinical Practice

Temperature as a Causative Factor in Diabetic Foot Ulceration: A Call to Revisit Ulcer Pathomechanics

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Continuous Diffusion of Oxygen Improves Diabetic Foot Ulcer Healing When Compared With a Placebo Control: A Randomised, Double-Blind, Multicenter Study

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Liu, George, Associate Professor

Three-Dimensional Computed Tomographic Characterization of Normal Anatomic Morphology and Variations of the Distal Tibiofibular Syndesmosis

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Manchanda, Kshitij, PGY-4

Severe Burn-Induced Inflammation and Remodeling of Achilles Tendon in a Rat Model

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McCrum, Christopher, Assistant Professor

Subacromial Impingement Anatomy and Its Association With Rotator Cuff Pathology in Women: Radiograph and MRI Correlation, a Retrospective Evaluation

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Complications of Biceps Tenodesis Based on Location, Fixation, and Indication: A Review of 1,526 Shoulders

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Quadratus Lumborum Block Provides Improved Immediate Postoperative Analgesia and Decreased Opioid Use Compared With a Multimodal Pain Regimen Following Hip Arthroscopy

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McIntosh, Amy, Associate Professor

Size Matters: Which Adolescent Patients Are Most Likely to Require Surgical Decompression for Lumbar Disk Herniations?

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Pediatric Pelvic Ring Injuries

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Ramo, Brandon, Assistant Professor

A New Radiographic Classification System for Developmental Hip Dysplasia Is Reliable and Predictive of Successful Closed Reduction and Late Pelvic Osteotomy

J Pediatric Orthopaedics

Raspovic, Katherine, Assistant Professor

Effectiveness of Viable Cryopreserved Placental Membranes for Management of Diabetic Foot Ulcers in a Real-World Setting

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Foot & Ankle Specialist

Riccio, Anthony, Associate Professor

Functional Outcomes Following Operative Treatment of Tibial Tubercle Fractures

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Flexible Intramedullary Nails for Femur Fractures in Pediatric Patients Heavier Than 100 Pounds

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Samchukov, Mikhail, Associate Professor

Biomechanical Considerations in Foot and Ankle Circular External Fixation: Maintenance of Wire Tension

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Sammer, Douglas, Associate Professor

Arthroscopic Ganglionectomy in the Pediatric Population

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Comparison of Fracture Location and Extent of Comminution in Isolated Scaphoid Fractures vs. Transscaphoid Fracture-Dislocations

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Oral Antibiotics Are Effective for the Treatment of Hand Osteomyelitis in Children

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Sanders, Drew, Assistant Professor

New Concepts of Radiologic Preoperative Evaluation of Anterior Shoulder Instability: On-Track and Off-Track Lesions

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Sathy, Ashoke, Associate Professor

Complications After Pelvic Arteriography in Patients With Pelvic Ring Disruptions

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Shah, Jay, Assistant Professor

Sleep Quality in Patients With Rotator Cuff Disease

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Shirley, Zach, Assistant Professor

Current Clinical, Radiological, and Treatment Perspectives of Patellofemoral Pain Syndrome

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Starr, Adam, Professor

Significant Reduction of Pulmonary Embolism in Orthopaedic Trauma Patients

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Sleep Disturbance in Orthopaedic Trauma Patients

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Sucato, Daniel, Professor

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Criteria for Surgical Reduction in High-Grade Lumbosacral Spondylolisthesis Based on Quality of Life Measures

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Is Less More? Assessing the Utility of Early Clinical and Radiographic Follow-Up for Operative Supracondylar Humerus Fractures

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Approach to the Hip for SCFE: The North American Perspective

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The Lumbar Gap Measurement in Lenke 1-4C Curves

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Perioperative Interdisciplinary Intervention Contributes to Improved Outcomes of Adolescents Treated With Hip Preservation Surgery

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Can Real-Time Monitoring With a Controlled Advancement Drill Decrease Plunge Depth?

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Wells, Joel, Assistant Professor

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Wilson, Philip, Associate Professor

Is Anteromedial Drilling Safe in Transphyseal Anterior Cruciate Ligament Reconstruction in Adolescents With Growth Remaining?

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Adolescent Clavicle Nonunions: Potential Risk Factors and Surgical Management

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Wimberly, Lane, Associate Professor

Retrograde Stainless Steel Flexible Nails Have Superior Resistance to Bending in Distal Third Femoral Shaft Fractures

J Pediatric Orthopaedics

Wukich, Dane, Professor

Hallux Valgus and Metatarsus Adductus Measurements: Interreader Reliability and Correlations on Radiographs and MRI

Clinical Radiology

Point vs. Traditional Method Evaluation of Hallux Valgus: Interreader Reliability and Intermethod Performance Using X-ray and MRI

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Hallux Valgus Evaluation on MRI: Can Measurements Validated on Radiographs Be Used?

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Renal Function as a Predictor of Early Transmetatarsal Amputation Failure

Foot & Ankle Specialist

Assessing Health-Related Quality of Life in Patients With Diabetic Foot Disease: Why Is It Important and How Can We Improve? The 2017 Roger E. Pecoraro Award Lecture

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Patients With Diabetic Foot Disease Fear Major Lower-Extremity Amputation More Than Death

Foot & Ankle Specialist

Increased Rates of Readmission, Reoperation, and Mortality Following Open Reduction and Internal Fixation of Ankle Fractures Are Associated With Diabetes Mellitus

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Diagnostic Utility of Erythrocyte Sedimentation Rate and C-Reactive Protein in Osteomyelitis of the Foot in Persons Without Diabetes

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Biomechanical Efficacy of Shear-Reducing Diabetic Insoles: Elaborations on Future Design Criteria

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Achilles Pain, Stiffness, and Muscle Power Deficits: Midportion Achilles Tendinopathy Revision 2018

J Orthopaedic Sports Physical Therapy

Zhang, Andrew, Professor

The Basic Science of Dupuytren Disease

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