



UT Health
San Antonio
Orthopaedics

The San Antonio Orthopaedic Journal

2023-VOLUME VI



EDITORS

Christina I. Brady, MD; Jose M. Gutierrez-Naranjo, MD;
David Heath, MD; Boris A. Zelle, MD, FAAOS, FAOA



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1. Higuera-Rueda CA, Emara AK, Nieves-Malloure Y, et al. The Effectiveness of Closed-Incision Negative-Pressure Therapy Versus Silver-Impregnated Dressings in Mitigating Surgical Site Complications in High-Risk Patients After Revision Knee Arthroplasty: The PROMISES Randomized Controlled Trial. *J Arthroplasty*. 2021 Jul;36(7S):S295-S302.e14. Note that the length of therapy may be outside the range recommended in the Instructions for Use.
2. Cooper HJ, Bongards C, Silverman RP. Cost-Effectiveness of Closed Incision Negative Pressure Therapy [PREVENA] for Surgical Site Management After Revision Total Knee Arthroplasty: Secondary Analysis of a Randomized Clinical Trial. *J Arthroplasty*. 2022 Aug;37(8S):S790-S795.

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Preface



Christina Brady, MD
Boris A. Zelle, MD

It is our pleasure to present the sixth edition of the *San Antonio Orthopaedic Journal* (SAOJ). We feel that this edition represents another high-quality product and is a testament to the hard work and dedication of everyone within our organization. It is also an exciting opportunity to reflect on our accomplishments and progress over the past year. Special thanks go out to our industry sponsors, who make it possible for our department journal to continue to grow in size and quality. Moreover, we are grateful for the various contributions from members of the department who have provided valuable insights and helped to shape this edition. This year, we are especially proud to highlight the continued growth of our orthopaedic department, including our new coverage of the local XFL football league, as well as the addition of new

faculty members Thomas DeBerardino MD, Case Martin MD, Brian Sager MD, Collin Pehde, DPM, and Cyaandi Dove, DPM. We are also excited to share the results of our ongoing research efforts, which reflect the continued academic growth of our department. We hope that this journal will be an engaging read and an inspiring reminder of our collective efforts to make a positive impact. Finally, we would like to congratulate the graduating class of 2024. We are very proud of this talented group, with all graduating residents pursuing top-notch fellowships in sports medicine, hand, foot and ankle, and spine surgery. We look forward to welcoming these skilled and knowledgeable individuals to our alumni program. We have no doubt that your future will be bright.

Editorial



David M. Heath, MD
Resident Editor-in-Chief

It is my distinct honor to serve as the Resident Editor-in-Chief of the sixth edition of the *San Antonio Orthopaedic Journal*. Over the past year, the UT Health San Antonio Department of Orthopaedics has continued to set the standard in San Antonio and South Texas for patient care. This past year saw a remarkable amount of growth for the department and numerous academic and professional accolades for its members. As we continue to expand the department and its reach in the community, we more readily establish ourselves as the premier orthopaedic care provider in the region. Additionally, this year's accomplishments on the national stage have furthered the remarkable legacy of the department and have cultivated a culture of excellence from the top down.

The sixth edition of the *San Antonio Orthopaedic Journal* includes a memorial of Elizabeth A. Szalay, MD of the Class of 1983 by Christina I. Brady, MD, and highlights the extraordinary growth of the department and the residency program. The department continues to see rapid expansion with the addition of Thomas M. DeBerardino, MD, Brian W. Sager, MD, and Case W. Martin, MD. Each has written a short biography in this edition to introduce themselves.

This edition will also outline several recent accolades of the department's members. The Journal's Editors in Chief each had a highly productive year and saw recognition for their achievements. Boris A. Zelle, MD was the first recipient of the Diversity, Equity, Inclusion, and Health Disparities

Research Award from the Orthopaedic Trauma Association (OTA). Christina I. Brady, MD was promoted to Chief of Orthopaedic Surgery at the Audie L. Murphy Memorial Veterans Hospital. Further, the department chairman, Robert H. Quinn, MD, completed five years as Chair of the Research and Quality Council of the American Academy of Orthopaedic Surgeons (AAOS).

The residency program has continued to grow alongside the faculty as there are now two classes of seven residents, up from the previous number of six per year. Under the direction of Ryan Rose, MD, residents have been able to rotate at a variety of local hospitals and gain early exposure to all orthopaedic subspecialties with an emphasis on operative experience and outstanding patient care. The graduating class this year consists of Jason T. Goodrum, MD, David M. Heath, MD, Galen J. Mills, MD, Liliana A. Ogden, MD, Gus J. Strauss III, MD, and Adam J. Ward, MD. Each is pursuing additional training in competitive fellowships across the country, reflecting the esteemed reputation and national reach of the residency program.

In closing, UT Health San Antonio Department of Orthopaedics has had many great accomplishments this past year. Many of these have been associated with the tremendous growth we are experiencing. As you will find as you read, this growth has been both departmental and personal. I sincerely hope you enjoy this sixth edition of the *San Antonio Orthopaedic Journal*.

Foreword



Fred G. Corley, MD

Congratulations to the editors of the Volume VI of the *San Antonio Orthopaedic Journal*.

Drs. Brady, Gutierrez-Naranjo, Heath, and Zelle did a superb job of compiling, selecting, and presenting our residency as it should be presented as one of the best in the country.

I have the great pleasure of knowing every resident from the first class in 1971 until the present. The only other that has that same distinction is my great friend Jesse Delee. Every year I am mildly surprised that our residents that finish that year are much like the ones that finished in the first residency graduation class. Young men and women of good character, superb intellect, and a desire to serve their fellow man.

Four icons of the program, Rockwood, Green, Wilkins, and O'Brien were great mentors, great friends, and men of vision who established a pattern for all of us to follow. Your approach to a patient and their diagnosis is based on history, physical exam, applied anatomy, ancillary studies, and meticulous surgical technique.

There was always a distinction between "taking care of the patient" and "caring for the patient." Dr. Brady's tribute to Elizabeth Szalay was exactly what Elizabeth embodied – a strong, caring, compassionate physician, who truly engaged in "caring for the patient."

Looking at the noun "Foreword", you can drop the "e" and change the second "o" to an "a" and the word becomes Forward – which is where this department is headed. I will close with this document from our visiting professor in 2007, S.T. Canale, MD, of the Campbells Clinic, who knew well how to treat patients.

INTERACTING WITH PATIENTS

S. TERRY CANALE, M.D.
AOS Meeting, April 2007.

1. Patients like to be shown their x-rays.
2. Forty-four percent of patients don't mind you calling them on the phone to update them on their x-rays or lab studies.
3. Most patients would rather not come back to the office to review a lab study or an x-ray, if possible.
4. You are only as good as the amount of time that you give to the patient.
5. Thirty-seven percent of the time that doctors spend in the office with patients is out of the patient's room.
6. You should anticipate and cement the close of a patient's visit by:
 - summarizing the findings.
 - reviewing the steps that you had gone through about future visits, about phone calls and about test results.
 - you should say goodbye and wish the patient well.
7. You should report the test results to the patient either on the phone or by letter.
8. Occasionally go into your waiting room and see what people are doing out there.
9. Listen to their stories.
10. Seventy percent of all good communication is non-verbal; you should lean forward to embrace the patient. You can be emotional; you should say things like, "correct me if I'm wrong"; you should always say like in a marriage, "honey, I'm sorry, it's all my fault".
11. Keep the regime that you give the patients simple, write the regime out on a piece of paper, follow up and comment about the patient's adherence; you want to tell the patient what you are going to tell them and how they need to do it and then hold them to it.
12. Enjoy the patient.
13. The patient usually has three complaints.
14. The doctor should say, "I want to make sure I have everything that you are concerned about".
15. "That may be a little more than we can do today, is that okay?"
16. Use open-ended questions, i.e., "I'm curious about.....".
17. Allow the patient the time to tell his story, it usually takes two minutes; and empathize with the patient.
18. The patient doesn't care how much you know until he knows how much you care.
19. A good opening remark is, "how can I help you today?"
20. Make eye contact.
 - sit down.
 - alcoholics and drug addicts usually don't make eye contact.
21. Expose the part to be examined.
22. Show x-rays.
23. Encompass the patients.
24. Avoid phone calls.
25. There is a question of whether you should dictate in front of the patients.
26. At the end of the patient's visit, these are the things you should do:
 - explain the agenda.
 - sit down.
 - show x-rays.
 - follow down.
 - give standard education.
 - avoid all interruptions.
 - educate the patient.

Chairman's Corner



Robert H. Quinn, MD, FAAOS, FAOA
Chair, Department of Orthopaedics

I am pleased to introduce the sixth edition of the *San Antonio Orthopaedic Journal*, marking our department's 55th anniversary. I am very proud of the superb faculty we have either recruited or retained across all of our disciplines. I am particularly proud of the winning culture we have created. Our residency and fellowship programs are re-invigorated and thriving while attracting the best and brightest applicants from across the country.

One year after the passing of Dr. Rockwood we continue to mourn his absence even though his legacy remains within each and every one of us and throughout the Department.

Construction is now well underway for the UT Health Multidisciplinary and Research Hospital. It will be a cancer/specialty hospital with a significant orthopaedic footprint. Doors will open in less than two years. The single biggest impediment to growth at UT Health since its founding has been a lack of a large revenue source with which we can invest in our future. The practice plan has done exceedingly well but simply does not create the type of margin necessary to advance our missions of patient care, education, and research into the top tier of academic medical centers. This hospital represents a great step forward in the evolution of our academic medical center.

Separately, construction is also well underway for our new medical office building with complete imaging capabilities and a freestanding ambulatory surgical center. Doors are scheduled to open within the next year. This building will be located on the campus of our sister institution UTSA. It will represent a major hub for our outpatient musculoskeletal ser-

vice line activities with a heavy emphasis on sports medicine.

We have created a true sports medicine partnership with the San Antonio Spurs. Together with the Spurs, we are jointly recruiting a new primary care sports medicine physician who will be the dedicated team physician. This exciting partnership will further accelerate our rapidly growing sports medicine presence and portfolio.

Our multi-disciplinary spine center is making substantial progress under the direction of Dr. Chris Chaput which will be a partnership between orthopaedics, neurosurgery, and PM&R.

We anticipate a substantial and progressive growth in elective orthopaedic procedures in preparation for the new hospital, particularly in the areas of adult reconstruction and spine, and we will be working aggressively to expand our clinical volume and faculty recruitment in these areas.

We are seeing rapid growth and increasing demand in all of our specialty areas and will continue to recruit and grow aggressively to meet this demand and continue to enhance our core missions of education and research. This includes podiatry which is rapidly expanding under the leadership of Lee Rogers, DPM, who is well on his way to achieving his vision to reestablish our program as the international leader in the management of diabetic foot challenges.

I remain proud, and humbled, to lead such a great group of faculty, residents, researchers, and staff. These are exciting times in San Antonio and I look forward to watching our great program grow and mature.

01

Special Announcements

New Faculty



Thomas DeBerardino, MD
Chief of Sports Medicine
Professor
UT Health San Antonio

Thomas DeBerardino MD is an orthopaedic surgeon and retired US Army Veteran specializing in arthroscopic surgery of the knee, shoulder, and hip and reconstructive procedures of the knee and shoulder.

Dr. DeBerardino graduated from the United States Military Academy in West Point, NY in 1985. He attended New York Medical College and then completed his internship and orthopaedic residency at Tripler Army Medical Center in Honolulu, HI. Dr. DeBerardino completed his training with the two-year John A. Feagin, Jr, Sports Medicine Fellowship at both Brooke Army Medical Center and the United States Military Academy's Keller Army Hospital. He returned to Brooke Army Medical Center in 1997, where he became the Chief of the Sports Medicine Service before moving back to West Point in 2001.

Dr. DeBerardino completed his 24-year Army career at the rank of Colonel. He served as Director of the West Point Sports Medicine Fellowship and Head Team Physician for Army Athletics before he retired from the Army in 2009. Dr. DeBerardino comes back to San Antonio now after seven years from 2009-2016 as an Associate Professor, Assistant Sports Medicine Fellowship Director, and Orthopaedic Team Physician for the Orthopaedic Surgery Department at the University of Connecticut Medical Center and the UCONN Athletic Department.

He has pioneered several open and arthroscopic knee and shoulder procedures and is a frequent speaker and teacher at national and international medical symposia on these procedures. He is board certified in orthopaedic surgery and sports medicine by the American Board of Orthopaedic Surgery. His research interests focus on clinical outcome studies mostly of the shoulder and knee. He has authored more than 98 peer-reviewed papers and many book chapters. His practice has been a busy tertiary referral sports medicine practice emphasizing knee and shoulder joint preservation, restoration, reconstruction, and transplantation (meniscus and cartilage) helping patients from across the United States, Canada, South America, and Europe.

Dr. DeBerardino moved back to San Antonio in 2016 and is currently Professor of Orthopaedic Surgery at UT Health San Antonio, Department of Orthopaedic Surgery. Dr. DeBerardino has a passion to serve as a team physician, teach and perform clinical research, so it was a natural transition to move back to Texas and join the amazing faculty of the

UT Health San Antonio Orthopaedic Surgery faculty. He has been a team physician since 1997 and is excited to help take care of athletes of all ages

When he is not taking care of patients, Dr. DeBerardino enjoys spending time with his family, traveling abroad, and escaping to the Colorado Rockies for the cool summer nights and the amazing winter ski season.



Case Martin
Orthopaedic Trauma
Assistant Professor
UT Health San Antonio

Dr. Martin has deep roots in Texas where he was born and raised. He grew up in Dallas, Texas where he attended high school at St. Mark's School of Texas and then received his Bachelor of Arts degree from Northwestern University in Evanston, Illinois. Dr. Martin then was awarded a Princeton in Africa fellowship, affiliated with Princeton University, and he worked with the International Rescue Committee in South Sudan for a year. He completed graduate school in England where he earned a Master of Science degree from the University of Oxford. Dr. Martin returned to Texas and graduated from the University of Texas Southwestern Medical School. He then trained as an orthopaedic surgery resident at the University of Texas Health San Antonio. He completed an orthopaedic trauma fellowship at Stanford University in Palo Alto, California under the instruction of renowned leaders in the field. Dr. Martin received the prestigious AO Trauma North America John Border Memorial Fellowship and returned to the University of Oxford in England where he received additional orthopaedic trauma training.

Dr. Martin specializes in orthopaedic traumatology and focuses on caring for patients with acute orthopaedic fractures and injuries as well as those who have post-traumatic deformities and complications. To restore patients' function and quality of life, Dr. Martin reviews various treatment options and develops personalized plans of care with each patient. Dr. Martin's clinical interests include periarticular fractures of the upper and lower extremity, adult hip reconstruction, pelvis and acetabular surgery, and fracture nonunions and malunions. He also has an interest in clinical research having co-authored multiple orthopaedic trauma articles in leading peer-reviewed journals and numerous book chapters.

Dr. Martin met his beautiful and inspirational wife, a native of San Antonio who now practices as an obstetrics and gynecology physician, while attending medical school together. Drs. Martin are both humbled to have the chance to return home to San Antonio. They are excited to work along-

side many of their former mentors and to help train the next generation of residents in their respective fields. Dr. Martin is particularly excited by the volume of orthopaedic trauma and the wide range of acuity and pathology treated by the UT Health San Antonio orthopaedic faculty coupled with the regions' burgeoning population and department's opportunity for continued growth in the region.

Dr. Martin and his wife love spending time with their two amazing children. When not in the operating room, Dr. Martin enjoys spending time with his extended family in San Antonio and California, traveling and exploring new cultures with his wife, hiking, skiing, and taking family beach trips to Port Aransas.



Brian Sager, MD
Hand and Upper Extremity
Assistant Professor
UT Health San Antonio

Dr. Sager was born and raised in Odessa, Texas where he attended high school at Odessa Permian High School, home of the original "Friday Night Lights". He attended Texas Tech University and majored in Chemical Engineering before completing his medical school at the University of Texas Health Science Center at San Antonio. He completed his Orthopaedic Surgery residency at the University of Texas Southwestern Medical Center and Parkland Hospital. Having been in Texas his entire life, he wanted to experience something different so he finished his training as the Emmanuel Kaplan Fellow in Hand and Upper Extremity Surgery at the prestigious New York University Hospital for Joint Diseases. After his training, he returned to West Texas where he worked in private practice in Abilene, Texas for three years.

While in Abilene, he and his wife Cara welcomed their first daughter, Emma Blair, to the world. Dr. Sager was grateful for the opportunity to care for his native West Texans, but missed the comradery that teaching provided. Fortunately, an opportunity arose at the UTHSC – San Antonio and he eagerly accepted a position on the faculty. He is excited to work with his Orthopedic and Hand Surgery Colleagues to provide the best care to San Antonio patients while also teaching some of the techniques that helped him thrive in private practice. He is excited to help the department grow and prosper.

Dr. Sager provides comprehensive diagnosis and treatment plans for a wide array of hand and upper extremity conditions. His treatments include both operative and non-operative modalities for hand and upper extremity trauma, peripheral nerve issues, hand and wrist arthritis, tendon and ligamentous pathologies and deformities about the hand and wrist. His goal is to develop individualized treatment plans aimed at restoring function and mobility to the patients of San Antonio.

While not treating hand and wrist patients, his outside interests include traveling, hunting, fishing, Texas Tech ath-

letics, and spending time with his family. They are currently expecting another little girl in July.



Collin Pehde, DPM

Dr. Pehde joined as Assistant Professor/Clinical and Director of the Amputation Prevention and Research Fellowship. Dr. Pehde specializes in diabetic limb salvage and reconstruction and was previously employed at the Foot and Ankle Center of Nebraska and Faculty at Des Moines University College of Podiatric Medicine and Surgery. He completed a joint residency program at West Penn Hospital in Pittsburgh, PA and West Houston Medical Center in Houston, TX and a Limb Deformity Internship at the Rubin Institute for Advanced Orthopedics in Baltimore, MD.



Cyaandi Dove, DPM
Director of Clinical Research

Dr. Dove joined as Assistant Professor/Clinical and the Director of Clinical Research for the Division. She completed residency at UTHSCSA and began working in clinical research with renowned researcher Peter Sheehan, MD in New York, NY. She has focused her career on clinical research and completed numerous diabetic foot trials.

Special Achievements



Boris Zelle, MD
Orthopaedic Trauma Association DEI
and Health Disparities Research Award

Dr. Boris Zelle received the DEI and Health Disparities Research Award from the Orthopaedic Trauma Association (OTA). Dr. Zelle was nominated for this award by his senior partner, Dr. Animesh Agarwal. Over the last ten years, Dr. Zelle and his collaborators have published numerous research papers on healthcare disparities with a special focus on disparities affecting Hispanic trauma patients. These investigations included the study of language barriers, medical mistrust, access to healthcare, as well as nutritional deficiencies. The OTA is the worldwide leading society in the field of orthopaedic trauma, and this award is also a testimony of the high national and international visibility of our rigorous research activities at UT Health San Antonio. The award ceremony was held at the annual OTA meeting in Tampa, FL, Oct. 12-15, 2022.



Award ceremony at the OTA annual meeting: Drs. Brendan Patterson (OTA President), Boris Zelle, Animesh Agarwal, and Michael Archdeacon (Immediate Past OTA President)

Philanthropy

Karen and Ronald Herrmann made a very generous donation of \$100,000 to support the UT Health hip fracture research program, as led by Dr. Boris Zelle. We are extremely grateful for the generosity and vision of the Herrmann-Zeller Foundation. Their contribution will open new venues of research in hip fracture care and lead to innovative approaches that will improve patient outcomes. Specifically, this donation will support research on nutritional optimization in patients with hip fractures. Over the years, the wonderful Herrmann family has made several donations to the Health Science Center and has made a strong impact on the research and education at our institution. Again, we are nothing but grateful for their strong support of our mission.



Robert Quinn, MD – 5 years as Chair of the AAOS Council on Research and Quality (CORQ)

The Council on Research and Quality (CORQ), serves to advance the application of scientific knowledge to improve the safety and effectiveness of musculoskeletal care. The council develops and disseminates evidence-based tools that facilitate physicians use of clinical practice guidelines and appropriate use criteria.



Christina I. Brady, MD VA Audie Murphy Orthopaedic Surgery Section Chief

Christina I. Brady MD has been appointed as the Section Chief of the Division of Orthopaedic Surgery at the VA Audie Murphy.

Academic Promotions



Ravi A. Karia, MD
Promoted to Full Professor
Department of Orthopaedics
as of 9/1/2022

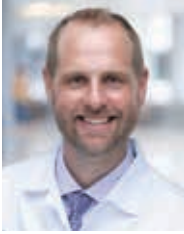


Christopher Chaput, MD
Promoted to Full Professor
Department of Orthopaedics
as of 9/1/2022



Ryan Rose, MD
Promoted to Associate
Professor
Department of Orthopaedics
as of 9/1/2022

Residency Updates



Ryan Rose, MD
Program Director

The University of Texas Health Science Center at San Antonio Orthopaedic residency continues to thrive year after year while seeing the largest complement of residents in its history. The values set forth by Dr. Rockwood continue to be at the core of the department and its residents. We now have 33 residents, with the expectation of 35 over the next two years. With that growth, we have been fortunate to create new rotations, including, Downtown and research, with electives and a hopeful international to come. With growth came the need for an Associate Program Director, and we were fortunate that Dr. Steven Gibbons, a pediatric surgeon, was willing to take on the task at full steam. He has helped create a formal system for interested medical students at home and nationwide. In addition, he has engaged medical students across the country with fireside chats open to any medical student, regardless of affiliation. This has created an interest in the program not previously seen.

2022-2023 continued the inertia set by the previous year regarding faculty growth. There were faculty additions in spine, trauma, joints, and hand. All four young faculty have quickly become resident favorites in and out of the operating room. On top of the robust clinical faculty, their acquisitions have led to case volumes in the country's 80-90 percentile range. Even in the face of faculty expansion outpacing residents and the overwhelming surgical volume, the core principle of "patients first" continues to be the cornerstone of the residency. Then, the residents assist and care for South Texas patients, making everyone involved in their care proud.

The graduating class of 2022 all passed their American Board of Orthopaedic Surgery Part 1 exams without diffi-

culty. This was a testament to their preparation and push for didactics changes. The current (Post Graduate Year 5s) took notice and have been a driving force in academic and clinical advancements. They have organized service-based didactics and preop conferences. Furthermore, they elected to take additional calls in downtown hospitals. They did this to not only gain more surgical experience, but also to decrease the burden on their juniors. This motivation is exemplified by the excellent fellowships they matched with for the 2023-2024 year. These include Lake Tahoe, Taos Ortho, UCLA for Sports, Emory for foot and ankle, NYU for spine, and Florida Orthopaedic Institute for hand. These fellowships will be proud of our residents and improve by training them.

Our residents' pride in their work has been acknowledged both locally, by the Graduate Medical Education Council, and nationally by the Accreditation Council for Graduate Medical Education. The GME has repeatedly contacted me to praise our residents for their decorum and work ethic. This year's resident survey had some of the highest satisfaction scores in all of UTHSCSA. This proves that the residents have formed and helped build a residency they are proud of and one the Alumni can be proud of also. This year our program also achieved full Continued Accreditation with Commendation by the ACGME, a feat rarely achieved.

It is impressive that the heights the residency has achieved have only strengthened the residents' and faculty's resolve to climb even higher. Thank you to the residents, faculty, education office, and everyone who makes this residency great. I look forward to seeing what we can achieve in the future.



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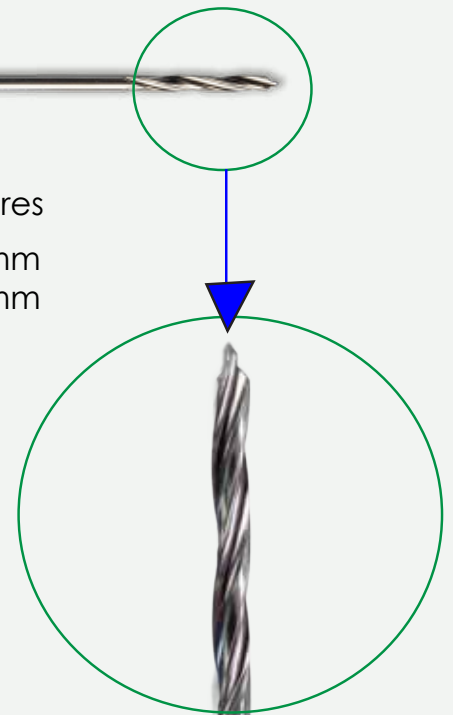
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2.2mm, OAL 145mm
2.5mm, OAL 145mm
2.5mm, OAL 230mm
2.7mm, OAL 175mm
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3.5mm, OAL 145mm
4.0mm, OAL 145mm
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4.3mm, OAL 180mm
4.3mm, OAL 340mm
4.5mm, OAL 145mm
5.0mm, OAL 145mm

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Chief Residents



Jason T. Goodrum, MD

Jason was born and raised in Nacogdoches, Texas. His tenacity from an early age manifested itself onto the soccer field and classroom which landed him a scholarship to play Division 1 soccer at Appalachian State University in North Carolina. He ended his soccer career and undergraduate studies at Quachita Baptist University in Arkansas. His passion for the game and personal trials with injuries made his decision abundantly clear to pursue orthopaedics. He went on to complete medical school at the University of Texas Medical Branch at Galveston. Jason's journey to residency with UT Health San Antonio was divinely appointed. He is honored to have been selected into a program with unparalleled mentorship, passion and autonomy. Outside of orthopaedics, Jason adores his wife Annabel, two puppies and capitalizes on any opportunity to spend time with his family. After residency, Jason will be completing fellowship training in Sports Medicine at Barton Hospital in South Lake Tahoe, California. He looks forward to fine-tuning his surgical skills and snowboarding in his spare time. He will return to the great state of Texas to practice general orthopaedics with a focus on sports, joint reconstruction, and trauma. His faith and family have been pillars for him thus far and will continue to be on the journey ahead. As Jason reflects on the past five years, he is filled with the utmost re-

spect, gratitude, and devotion to this program for shaping him into the orthopaedic surgeon he has dreamed to be.



David Heath, MD

David was born in Corpus Christi, Texas and ultimately raised in Round Rock, Texas after moving around some as a child. He attended Furman University for the first two years of undergraduate school, where he played linebacker on the football team. He then transferred to Baylor University to be closer to home. From there, he achieved a Bachelor of Science in Biology degree and was accepted to UT Health Science Center San Antonio for medical school. In his search for a career working with his hands to help others, he gained exposure to orthopaedics and was accepted to UT Health San Antonio for residency. During his time in residency, he has experienced tremendous personal and professional growth and has been fortunate to become close to many of the faculty and other residents. From here he will go to the University of California, Los Angeles for a fellowship in Sports Medicine. He will be accompanied by his wonderful wife and high school sweetheart Sabrina, his two-year-old daughter Madison, and their two dogs. The Heath family will then return to San Antonio, where David has signed on to join the Sports Medicine division of the UT Health San Antonio Department of Orthopaedics.

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Liliana Ogden, MD

Liliana “Lily” Ogden, MD, was born and raised in San Antonio, Texas. She attended Texas A&M University in College Station where she studied Kinesiology. She had always planned to apply to medical school, inspired by her parents who are both podiatrists. Upon completing her undergraduate degree, she was lucky enough to end up back home at the UT Health San Antonio Long School of Medicine and subsequently matched to this Orthopaedic Surgery Residency Program. She was drawn to the camaraderie between residents and the autonomy the program offers. Throughout residency, she considered a handful of different subspecialties to pursue and ultimately decided on Foot & Ankle due to the variety of cases and pathology the specialty offers. She will be attending Emory University for her Foot & Ankle Fellowship later this year.



Jamie Strauss, MD

Jamie Strauss is a native Texan, born in Victoria, and raised in Hallettsville and Columbus. He graduated from Texas A&M University with a Bachelor of Science in Biology and stayed in College Station for his medical degree. While rotating through UT Health San Antonio during his fourth year of medical school, the camaraderie between the residents made the program feel like home, and he knew he would be exposed to a myriad of orthopaedic subspecialties. He knows San Antonio was the right call for his training, and he is grateful for the growth, opportunities, and lifelong relationships established over the last five years.

Jamie, along with his wife Jordan, and two kids, IV and Palmer, will be moving to Tampa where he will complete a hand and upper extremity fellowship at Florida Orthopaedic Institute before hopefully returning home to Texas. He is looking forward to establishing himself within a smaller practice and plugging himself into his community. When he’s not on call, he plans to spend his weekends with his family watching Aggie sports, golfing, or fishing at the coast.



Galen Mills, MD

Galen grew up on a small farm in northern Wyoming. He was blessed with a great childhood and he credits his parents, Gary and Gail, and his siblings, Gavin and Nikki, for helping him become an asset to society rather than a liability. In high school, he was a passionate youngster and loved football and science and wanted to make a difference in the world. He took this passion to Carroll College in Helena, MT where he joined the football team and studied pre-med biology. During college, he fell in love with fellow classmate, Kelsey, and they were married

after graduating. Galen was then accepted into the University of Washington School of Medicine, but was granted a deferral to volunteer with his wife with a Christian ministry in Guatemala. This was a formidable year and left a lasting impression on them both. Once exposed to orthopaedics in medical school, Galen felt a natural affinity to the specialty where he could make a difference in people’s lives by honing skills similar to the basic skills he learned while working in the shop as a kid. Galen’s twin brother, Gavin, was matched to the San Antonio Military Medical Center (SAM-MC) orthopaedics residency the year prior which paved the way for Galen to end up in orthopaedics and Texas. While rotating here, Galen met people who showed him what his future could look like if he trained here which made it an easy choice. Galen and Kelsey have since been blessed to have Oliver (5) and Lucia (2) join their family along the way. Countless friends, co-residents, and attendings have made the past five years in San Antonio an incredible journey and he is immensely grateful to everyone that played a part in this Texas chapter of life. Galen and his family will be moving to Taos, NM for a Sports Medicine fellowship before moving back to Wyoming or Montana to settle down.



Adam Ward, MD

Adam was born in Fort Walton Beach, Florida, and grew up in Alamogordo, New Mexico. His unlikely journey through life started as a teenager whose hobby of working with tools led him to New Mexico State University where he completed his undergraduate degree in Mechanical Engineering. A career spanning seven years working as an engineer helped to develop his innate skills as he designed, developed, and built new products. Despite success in his work, Adam wanted a career more stimulating, fulfilling, and hands-on. More importantly, he wanted a career where his hard work would positively impact lives. To achieve his aspirations, Adam returned to school and earned his medical degree from The University of Texas Medical Branch, and this summer he will complete his residency in Orthopaedic Surgery at the University of Texas Health San Antonio. His love of mechanical engineering, and orthopaedic surgery, as well as his desire to directly help others focused his attention on the field of Spine Surgery. After residency, he will move to New York City to complete his fellowship year at New York University Langone Orthopaedic Hospital. Arguably more impressive, during residency Adam met the love of his life and source of constant support and encouragement, and married his beautiful wife, Lauren. They adopted two loving dogs, Moose and Millie, and are preparing for all new adventures in the big city. After fellowship, Adam and Lauren plan to move back to Florida where he can start his spine surgery practice, and they can build a family. One day, he hopes to combine his mechanical engineering brain with the field of spine surgery to contribute to the evolution of technology and discover new methods to better serve his future colleagues.

Orthopaedic Residents 2022-2023

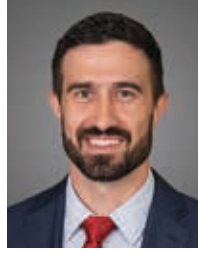
PGY 5 2018 - 2023



Jason Goodrum



David Heath



Galen Mills



Liliana Ogden



Gus Strauss



Adam Ward

PGY 4 2019 - 2024



Connor Armstrong



Jacob Brennan



Adam McNulty



Gautham Prabhakar



Clinton Ulmer



Meagan Womack

PGY 3 2020 - 2025



Stephanie Jones



Ezekial Koslosky



Kathleen Lundquist



Sam Ornell



Annat Houston



Loc-Uyen Vo

PGY 2 2021 - 2026



Travis Bullock



Jordan Carter



Andrew Eck



Chimobi Emukah



Ahmed Makhani



John Parker



William Young

PGY 1 2021 - 2027



Doha Hussien



Zachary Jodoin



Casey McDonald



Mallory Ogburn



Kyle Paul



Elizaveta Reznichenko

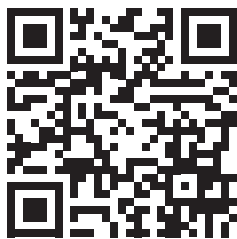


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Clinical Updates

Clinical Division



Adult Reconstruction

*Frank A. Buttacavoli MD
Chief, Adult Reconstruction*

The adult reconstruction service has seen a return to near normalcy with elective surgery in 2022. Our service is actively catching up to the backlog of many joint replacements that were delayed due to COVID-19. The addition of Dr. Chance Moore in the last year has been very helpful with patient care, resident education, and research. Belinda Peña, NP has joined our service from her previous circulator position at University Hospital. She was a department favorite to work within the operating room and we are very happy she has joined our department. She has been an excellent addition to the adult reconstruction team. Since starting in October of 2022, she improves monthly in her clinical duties, administrative duties, and her service to the institution and residency.

I continue in my role as chief of the service and have been appointed to the hip and knee reconstruction evaluation committee for the American Academy of Orthopaedic Surgeons for a two-year term. I continue to work with University Hospital and other hospitals in the community to help build efficient joint service lines with a focus on patient outcomes. We have begun to measure these outcomes consistently with “PROMS” (Patient Reported Outcome Measures) in the clinic and we have joined the American Joint Replacement Registry at University Hospital.

We have been more active with service line specific research. We recently completed enrolling all patients in a prospective study evaluating negative pressure therapy in primary knee arthroplasty. We look forward to reporting the completed one-year follow-up in October of 2023. We have also joined with the University of Texas orthopedic department in Austin comparing value-based care models to standard delivery models of care. We are evaluating shared decision-making tools with patient-reported outcome measures and patient-preferred outcomes to enhance joint replacement care delivery.

We are also excited our institution has been chosen for the trial of a new device with Osteal Therapeutics for the treatment of periprosthetic joint infection. We will begin enrolling patients shortly in 2023.

The resident experience is consistent in weekly adult reconstruction conferences, robotics, anterior hip replacement, and complex primary and revision arthroplasty. We have two excellent residents, Dr. Connor Armstrong, and Dr. Jacob Brennan, applying for adult reconstruction fellowships this

year. We are excited to see more of our residents in the last five years choose adult reconstruction as a fellowship path. Our recent graduate Dr. Jordan Handcox, will be starting her fellowship in adult reconstruction at Stanford University.

We currently have a position available for the adult reconstruction service. We look forward to the growth in the department as well as our individual service line. We hope to grow the number of joint surgeons to match the growing needs for primary and revision joint replacement in San Antonio.



Foot & Ankle Surgery

Mayo J. Galindo Jr., MD

Our Foot & Ankle division is currently staffed by Mayo J. Galindo Jr., MD as full-time faculty. Katherine C. Bartush, MD contributes her foot & ankle sports acumen to the department. Our residents participate in the private sector with Mark M. Casillas, MD.

As PGY3s, in their two-month rotation, our residents are exposed to common foot and ankle problems, and also low-energy trauma. Complex reconstructions have become the norm. Diabetic foot salvage challenges are also part of their experience. Dr. Casillas offers a wealth of experience in total ankle replacement surgery. Our residents are also exposed to ankle and hind foot arthroscopy, sports injuries, sports reconstruction, and sports rehabilitation. With the addition of another PGY1 resident, totaling seven residents, there may be an opportunity for an elective as upper-level residents.

In the past, we have hosted residents from a sister school in Monterey, Mexico. We are open to continuing that relationship, and hopefully, with travel restrictions easing after the COVID-19 crisis, we can start that program again. Post-pandemic, our surgical caseload has increased dramatically.

At the time of this writing, we are also seeking additional full-time staff to expand our “footprint.”



Hand-Plastics

*Brian Sager, MD
Christina Brady, MD*

The hand and orthoplastics service continues to grow as we aim to serve and provide top-notch hand and reconstructive care to the residents of San Antonio and Bexar County

This expansion is thanks to the unremitting efforts of Drs. Ryan Rose, Brian Sager, Douglas Cromack, Fred Corley, and Christina Brady, along with the combined efforts of our incredible supporting staff: PAs Marc Deschaine, John Kodosky, Pricilla Ramos, Ashlee Blume, and Certified Hand Therapists, Susan Haas and Jessica Mickey. In addition, the upper extremity, or “Red Service”, is supported by three residents, an intern, a second-year and chief resident, along with a plastic surgery fellow.

The hand division continues to cover the trauma needs of University Hospital, thanks to our strong presence led by Dr. Cromack, who continues to do invaluable work with complex hand reconstruction, pediatric hand, and brachial plexus, in addition to the soft tissue coverage needs of the orthopaedic trauma division. In addition, both Drs. Rose and Sager continue to meet the increasing demand for complex hand trauma at University Hospital. Dr. Sager has continued to expand our clinical presence in the greater San Antonio area through his presence at our UT Health Hill Country Clinic as well as through our new location at Metropolitan Methodist Hospital. Dr. Rose and Dr. Corley have continued to build a robust, complete upper extremity practice through the Medical Arts and Research Center. Dr. Corley also remains dedicated to the citizens of Bexar County through his clinic at the Texas Diabetes Institute. Within the Veterans Administration Hospital, Dr. Brady continues to serve the local Veterans of South Texas.

We are also very excited about the upcoming addition of Jason Coffman, MD. Dr. Coffman graduated from Texas A&M Health Science Center College of Medicine and completed his orthopaedic surgery residency at UT Medical Branch in Galveston. He is currently completing his hand surgery fellowship at the Hand Center of San Antonio and we are looking forward to his addition to the hand and upper extremity division.

We are also honored to announce several accomplishments amongst the “Red Service” this year. First and foremost, we are graduating Dr. Jamie Strauss who will be continuing his hand and upper extremity surgical training at the Florida Orthopaedic Institute Hand and Upper Extremity Fellowship in Tampa, Florida. Dr. Brady has expanded the efforts at the Veterans Administration Audie L. Murphy Hospital as she was named the Chief of Orthopedic Surgery. Dr. Sager successfully completed his Certificate of Added Qualifications in Hand Surgery and his application is under consideration to become a diplomat of the American Society of Surgery for the Hand. Additionally, we hope to showcase our expanding research efforts in this edition of the SAOJ with publications spanning hand infections, health disparities, and Dr. Cromack’s important contributions to the literature on free flaps.

As the upper extremity division grows, we will continue our commitment to serving San Antonio and Bexar County residents, preparing the next generation of orthopaedic surgeons, expanding the hand surgery knowledge base, and providing quality care through the work we do.



Oncology

Robert Quinn, MD

The oncology service is looking forward to the addition of Joseph Alderete, MD, this year. Dr. Alderete is completing his career in the army at the rank of Colonel and will be joining our faculty. In addition to oncology, Dr. Alderete has extensive clinical and research experience in limb salvage and amputations. He was the surgical director of the Center for the Intrepid from 2016-2021.

Currently, the service is staffed by Robert Quinn, MD, and Ashlee Blume, PA-C. Fortunately, the trauma team has stepped up to take excellent care of many of the pathologic fractures that come in through the ED. The extra help is much appreciated.

The service has a fourth-year resident. Clinic occurs at the Medical Arts Research Center and Mays Cancer Center. Surgery occurs at University Hospital and the MARC ASC. A multi-disciplinary tumor board occurs every week.

Construction is now underway for the UT Health San Antonio Multispecialty and Research Hospital which is on track to open its doors at the end of 2024. This will prove an exciting addition to UT Health and most oncology procedures will likely be performed there.

The oncology service continues the mission of expert multi-disciplinary management of bone and soft tissue sarcomas, benign tumors, metastatic tumors, metabolic bone disease, and limb salvage.



Pediatrics

Sekinat McCormick, MD

The pediatrics division continues to provide excellent service to our patients, our residents, and our students. In his role as the assistant program director Dr. Gibbons has been integral in the revamping of our residents’ annual schedule. This has come with the added challenge of going from a six-resident complement to seven. In addition to his work with our residents’ education, Dr. Gibbons continued with his annual tradition of serving as Santa Claus for all the patients admitted to the pediatric unit at University Hospital, bringing the joy of the holiday season to our patients unable to be home.

Dr. Landrum continues to be the ambassador of fun and ultimately resident wellness. This year, he has continued to host journal clubs for the resident and the faculty where several classic and contemporary novels generated fun discussion and, most importantly, fellowship of residents and faculty. The fun didn’t stop there, Dr. Landrum also arranged for a crawfish broil hosted at the home of Dr. Gibbons. Dr. Landrum brought a piece of his beloved Louisiana to us in Texas and boy did it live up to all the hype! It was a good time

with great food and even better company. Dr. Landrum will soon be departing as he pursues an opportunity in Arkansas. We will miss him dearly and wish him well on his upcoming move. We will be sure to carry on many of his traditions, particularly book club which has been an undeniable hit for our residents.

Dr. McCormick has continued at the helm of being a direct connection from our medical school students to our department. In addition to being a lecturer in their core curriculum, she was recently promoted to the role of Assistant Dean for the Office for Inclusion and Diversity after serving for ten months in the role of Interim Vice Dean for the office. In addition to the general role of her position within the Office for Inclusion and Diversity, Dr. McCormick has been able to use this position to amplify visibility for women in medical school to encourage them to explore a career in orthopaedic surgery. Increasing the number of women in orthopaedic surgery is something that Dr. McCormick remains passionate about. She is also passionate about celebrating the women in our program and creating the space and time for our female residents to collaborate and learn from one another.

All in all, it has been a great year for the pediatrics division, and while there are big changes ahead the team is ever ready to embrace it and use it as an opportunity to improve.



Women resident and faculty dinner



Crawfish



Crawfish boil with residents, faculty, and families



Cat Landrum and Jazmin Gibbons at the crawfish boil



Drs. Houston, Gibbons, Landrum, and Ogden spreading cheer at University Hospital



Dr. Ogden and Dr. Landrum passing out presents to hospitalized children for Christmas

Podiatry

Lee C. Rogers, DPM, FFPM RCPS(Glas) Division Chief

Attending Faculty

Lee C. Rogers, DPM, Division Chief

Alexander Blaschke, DPM,

Residency Director

Collin Pehde, DPM, Fellowship Director

Michael Sobolevsky, DPM

Cyaandi Dove, DPM, Director of Clinical Research

Education

The Division is home to one of the oldest podiatry residencies in the country, and the first residency in an academic medical center. The Podiatric Medicine and Surgery Residency (PMSR) is a 3-year program approved by the Council on Podiatric Medical Education (CPME). The UT Health San Antonio PMSR accepts three residents per year for a total of nine residents. The program is undergoing a review by CPME to expand to five per year starting in 2023. The program celebrated its 50th anniversary in December with past residents and faculty attending. Special guests included Jerry Patterson, DPM who was the first resident starting in 1972.

The Amputation Prevention and Research Fellowship is a 1-year experience focused on inpatient/outpatient/surgical care of the complex patient in need of limb preservation. Currently there are two fellows, Thanh Nguyen, DPM, and Stephanie Campbell, DPM.

The Division receives approximately 50 students from all nine US podiatry schools for externships annually. The 10th podiatry school opened in 2022 at UT Rio Grande Valley and the Dean is Dr. Javier La Fontaine, former resident, faculty, and residency director at UTHSCSA.



New Faculty

Collin Pehde, DPM, Director of the Amputation Prevention and Research Fellowship

Dr. Pehde joined as Assistant Professor/Clinical and Director of the Amputation Prevention and Research Fellowship. Dr. Pehde specializes in diabetic limb salvage and reconstruction and was previously employed at the Foot and Ankle Center of Nebraska and Faculty at Des Moines University College of Podiatric Medicine and Surgery. He completed a joint residency program at West Penn Hospital in Pittsburgh, PA and West Houston Medical Center in Houston, TX and a Limb Deformity

Internship at the Rubin Institute for Advanced Orthopedics in Baltimore, MD.



Cyaandi Dove, DPM, Director of Clinical Research

Dr. Dove joined as Assistant Professor/Clinical and the Director of Clinical Research for the Division. She completed residency at UTHSCSA and began working in clinical research with renowned researcher

Peter Sheehan, MD in New York, NY. She has focused her career on clinical research and completed numerous diabetic foot trials.

Clinical Activities

The Division's clinical work includes inpatient services at University Hospital (UH) and outpatient services at Texas Diabetes Institute (TDI) and the UT Health Medical Arts and Research Center (MARC). The residents are involved in training and clinical work at the Audie L. Murphy VA Medical Center with five additional adjunct faculty.

CME Educational Programs

The 15th Annual International External Fixation Symposium (IEFS) is scheduled for March 11-12, 2023 at UT Health San Antonio. The IEFS has hosted surgeons from 32 countries for unparalleled surgical training on the diabetic foot and ankle. This year, under Course Director Collin Pehde, DPM, the meeting will focus on the principles of external fixation and is honored to have two former trainees of Professor Ilizarov as faculty teaching the Ilizarov method. Registration is free for residents and 50% for UT-system faculty at www.exfix.org.

The Great Debates & Updates - Diabetic Foot was held in December 2022 at the Grand Hyatt on the Riverwalk in San Antonio. The conference is a collaboration between co-chairs Dr. Lee C. Rogers (UTHSCSA) and Dr. Lawrence A. Lavery (UTSW) and has a focus on evidence-based treatments and a multidisciplinary team approach to the complicated diabetic foot in a debate-style format. The Lawrence B. Harkless Leadership Award (named after the former Division Chief) was given to former UTHSCSA fellow and former faculty David G. Armstrong, DPM, MD, PhD of the University of Southern California. The next conference will be held in Dallas on November 30 - December 2, 2023. More information can be found at www.gduidiabeticfoot.com.

Research

UTHSCSA was recognized in a recent publication as the #10 most impactful institution in the US and #20 in the world for diabetic foot research¹. The addition of Dr. Dove has brought several clinical trials to the Division which will further the legacy of the institution.

Publications

Rogers LC, Bowling FL, Armstrong DG. Ch. 119 Podiatric and Vascular Teams in *Rutherford's Textbook of Vascular Surgery and Endovascular Therapy*, 10th Ed. 2022.

1. Shen JM, Chen J, Feng L, Feng C. A scientometrics analysis and visualisation of diabetic foot research from 1955 to 2022. *Int Wound J*. 2022 Sep 26. doi: 10.1111/iwj.13964. Epub ahead of print. PMID: 36164753.



Shoulder and Elbow

Anil K. Dutta, MD

The Shoulder and Elbow Service continues to be one of the pillars of the UTH-SCSA Department of Orthopaedic Surgery. The current division is focused on remaining one of the leading shoulder and elbow tertiary centers in the country and on continuing the legacy of Dr. Charles A. Rockwood's vision. The current full-time shoulder and elbow faculty are Dr. Bernard Morrey, Dr. Anil Dutta, Dr. Ian Whitney, and Dr. Phil Jacobs. The adjunct faculty are Dr. Robert Hartzler, Dr. John Hinchey, and Dr. Travis Burns. The fellowship program is proud to be one of the most comprehensive shoulder and elbow fellowships in the world with a balanced approach to trauma, joint reconstruction, and sports medicine in both the shoulder and elbow.

Dr. Morrey has carried the fellowship forward through the passing of Dr. Rockwood. The past year has seen a strengthening of the fellowship program with an increase in applicants and a return to traditional on-site interviews. The past two fellows have successfully moved on to critical practices with Dr. Kanawade taking on the position of chief of orthopedics in Mission Texas. Dr. Kim joined the faculty at the University of Florida Gainesville as both a shoulder and elbow surgeon and as a hand and microsurgery attending. Our current fellow is Tammam Hanna, MD. Dr. Hanna joined us after completing an upper extremity fellowship at the University of Mississippi. He is a former Army officer in the Lebanese Army and is now slated to join the faculty at Texas Tech University in Lubbock where he will be taking the lead on complex shoulder and elbow revision and trauma. He has had an outstanding year with the program and is currently completing a book chapter on complications in elbow surgery.

Dr. Dutta is the current senior clinical surgeon and continues his work in shoulder and elbow reconstruction with an emphasis on elbow replacement design. He is working with the Hospital for Special Surgery in their development of a new total elbow system with potential for an uncemented design. He is also involved in the launch of a navigation and guidance system for total shoulders and a stemless reverse shoulder arthroplasty system with Lima Corporate. He remains jointly assigned to ortho trauma and has recent publications on magnetic humeral nails in nonunions.

Dr. Ian Whitney, a graduate of our program, completed his fellowship with Dr. Rockwood's longtime colleague and co-author, Dr. Rick Matsen. He continues to grow his practice in both shoulder and elbow comprehensive care as well as adult reconstruction and sports. He has developed a complex tertiary care practice that includes extending care to the major private centers in San Antonio and beyond. Ian has also developed unique strategies in the treatment of shoulder revision and is working with Stryker on both shoulder and elbow reconstruction design and techniques as well as the use

of virtual reality and navigation in shoulder arthroplasty. He has also published a recent paper on interposition arthroplasty in the elbow. He remains an active participant in the care of college (UTSA) and high school sports as well.

Dr. Jacobs, both a Rockwood and Christian Gerber fellow, continues his leadership with shoulder surgery and sports medicine. He is one of the key members of the UTSA sports coverage team. He continues his investigative work with research on the rotator cuff including a joint venture with UTSA evaluating the utility of elastometry in the diagnosis of rotator cuff disease. He is also actively involved in the coverage of sports in the community school arena as well.

Robert Hartzler continues to be involved in the shoulder and elbow fellowship and is an emerging leader in the American Shoulder and Elbow Society. His work on muscle transfers, advanced shoulder arthroscopy, and reconstructive surgery of the shoulder and elbow is presented routinely at the national and international levels. John Hinchey and Travis Burns are both critical members of the fellowship program and provide leadership at the Audie Murphy VA Hospital, where they manage the shoulder and elbow service. The VA rotation includes all types of shoulder and elbow pathologies and is the referral center for South Texas veterans. The care of veterans was a cornerstone of Dr. Rockwood's mission statement and remains an enduring testimony to all that he stood for.



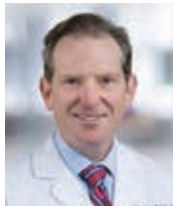
Dr. Hanna and his family



Dr. Morrey with Dr. Hanna



Drs. Burns, Whitney, Morrey, Kim, Dutta, Hinchey, and Cromack



Spine

Christopher Chaput, MD and Jeff Hills, MD



As this journal goes to publication, the buildout of the new multidisciplinary Spine Center at UT Health San Antonio on the fourth floor of the Medical Arts and Research Center building will be underway. The new center will include a room for the latest full body 3-D X-ray system (EOS). This system obtains low-dose weight-bearing images in a fraction of the time and will dramatically improve patient

flow, as the machine will be on the same hallway as most of the 16 exam rooms and the fluoroscopy room (for spinal injections). The inaugural staff of the center will include two adult orthopaedic spine surgeons, one pediatric spine surgeon, two neurosurgeons, three physical medicine and rehabilitation physicians, and four advanced practitioners. The goal of the spine center is to offer comprehensive, evidence-based spinal care that ranges from spinal injections and EMG testing to minimally invasive spine surgery, pediatric scoliosis, spinal oncology, and complex revision and adult spinal deformity surgery. A patient navigator will guide patients and referring physicians to the most appropriate specialist. All surgeons are spine fellows trained in spine surgery, and all specialists involved in the center are committed to providing patient-centric care in a team-based setting.

Research and clinical trials continue to grow in the division. Dr. Jeff Hills has brought state-of-the-art surgical planning to the operating room table, based on his extensive research that is redefining surgical realignment targets to maximize patient outcomes and minimize the risk of surgical failure. The fastest areas of growth for the division are in both adult and pediatric deformity. The new EOS system will be accompanied by a software suite that allows automated image analysis, which will enable residents and staff to investigate a wide range of research questions. Additionally, Dr. Chaput has two current randomized, prospective trials underway investigating the effects of new biologics on bone formation in the interbody space, one of which has already completed patient enrollment.



Left to Right: Dr. Hills (adult deformity), Dr. Chaput (Division Chief Ortho Spine), Dr. Mesfin (Neurosurgery/Spine), and Dr. Matt Landrum (Pedi Spine) heading to Philadelphia for a meeting together.

Selected publications:

1. Sardi JP, Lazaro B, Smith JS, Kelly MP, Dial B, Hills J, Yanik EL, Gupta M, Baldus CR, Yen CP, Lafage V, Ames CP, Bess S, Schwab F, Shaffrey CI, Bridwell KH. Rod fractures in thoracolumbar fusions to the sacrum/pelvis for adult symptomatic lumbar scoliosis: long-term follow-up of a prospective, multicenter cohort of 160 patients. *J Neurosurg* 2022
2. Lazaro B, Sardi JP, Smith JS, Kelly MP, Dial B, Yanik EL, Hills J, Gupta M, Baldus CR, Yen CP, Lafage V, Ames CP, Bess S, Schwab F, Shaffrey CI, Bridwell KH. Proximal junctional failure in primary thoracolumbar fusion/fixation to the sacrum/pelvis for adult symptomatic lumbar scoliosis: long-term follow-up of a prospective, multicenter cohort of 160 patients. *J Neurosurg* 2022
3. Cade A, Morris, Justin P, Moo Young, Jonathan C, Savakus, Mitchel R, Obey, Daniel E, Pereira, Jeffrey M, Hills, Ava McKane, Sharon N, Babcock, Anna N, Miller, Byron F, Stephens, Phillip M, Mitchell: Neurologic injury after spinopelvic dissociation: Incidence, outcome, and predictors. *Injury* 2022
4. Hills J, Lenke LG, Sardar ZM, Le Huec JC, Bourret S, Hasegawa K, Wong HK, Hey HWD, Liu G, Riahi H, Chelli-Bouaziz M, Kelly MP: The T4-L1-Hip Axis: Defining a Normal Sagittal Spinal Alignment. *Spine (Phila Pa 1976)* 2022.
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Sports Medicine

Katherine Bartush, MD

This year the Sports Medicine division has expanded team coverage and is now taking care of San Antonio's professional football team, the XFL Brahmas. We are in our second year caring for The University of Texas San Antonio, whose football team is now two-time Conference USA Champions. We attended the Cure Bowl in Orlando, Florida this year, where they lost a tough game to Troy, from Troy Alabama. Drs. Jacobs, Kenneth-Nwosa, and Bartush shared responsibilities for the week-long trip.

The division continues to be staffed by Dr. Katherine Bartush, Dr. Thomas DeBerardino, Dr. Philip Jacobs, Dr. Kenneth Nwosa, and Dr. Caitlyn Mooney.

Dr. Jacobs is in his 18th year as Orthopedic Surgeon for Taft High School and regularly oversees the Houston Open, a PGA Tour Event. This year he has also served as one of the instrumental Team Physicians for the UTSA Roadrunners.

Dr. Kenneth-Nwosa continues to serve as Head Team Physician at UTSA and has been honored as San Antonio's Primary Care Sports Medicine Top Doctor for 2023!

Dr. Mooney has been building and teaching an Orthopedics curriculum for UT Health San Antonio medical students. She also volunteers her clinic time to teach many Primary Care residents.

Dr. DeBerardino has been selected as the 2nd Vice President for the Clinical Orthopedic Society. He also hosted several international guest surgeons from Mexico and Brazil to observe in clinic and surgery. There will be several visiting from Saudi Arabia this spring. He has graciously given his time to teaching residents in the operating room and lab settings and has given astute guidance to our youngest faculty.

Michelle Aguirre continues to care for the Soccer Central community and has shown great determination to expand our footprint on local sidelines. She traveled with the US Gymnastics Team to Utah this year as their athletic trainer.

Marie Charpentier, PT, continues to serve as the Director of Rehabilitation at UTSA and the interim Associate Athletic Director. She seamlessly led a transition period as the Associate Athletic Director of Sports Medicine. Marie leads our residency for ATCs pursuing additional education in rehab techniques is in its 2nd year, and has had great success.

Nik Turner, ATC, and Brian Benitez, ATC, continue to work tirelessly to supervise medical care at UTSA, and they will be key in providing ATC services when the XFL plays in San Antonio. UTSA's football team has been ranked as high as 23rd in the 2022 season, thanks in large part to their commitment.

The Department is also grateful to our other subspecialty providers across UT Health San Antonio who keep our athletes healthy.

Summer Rolin, PSYD, and Sports Psychologist, current-

ly appointed in the Rehab Medicine department has also received a cross-appointment to Orthopaedics. She has been contracted by UTSA and provides neuropsychological evaluation, concussion evaluation, and consultation with medical providers, trainers, and coaches.

In February, Dr. Bartush and Dr. Jesse Delee, Clinical Professor, will host the 50th Annual UTHealth Sports Medicine Symposium. The keynote speaker will be Dr. James Andrews and we expect this year will have the greatest attendance yet.

The residents continue to show great enthusiasm for Sports Medicine. Interns are now getting exposure to Sports through a short rotation with Dr. Jacobs. The second-year resident spends time with Dr. Bartush. The fourth-years perform surgery and clinic with Dr. Michael Heckman. The VA experience is overseen by Dr. Travis Burns. The residents also participate in our new Friday Night Lights Clinic, designed to provide urgent care to South Texas athletes every Friday evening during football season. This year's patient volume exceeded that of last year.

Our Sports Medicine Team also performed UT Health San Antonio's first summer school-required physicals with no out-of-pocket cost. We had approximately 200 athletes and even more happy parents.

While our clinical services are expanding, our academic offerings are also growing. Dr. David Heath, PGY4, has published several papers in collaboration with our sports faculty. Most recently his paper, "Medial Meniscus Repair in Major League Soccer Players Results in Decreased Performance Metrics for One Year and Shortened Career Longevity" was published in the *Open Access Journal of Sports Medicine*. Finally, we have two residents pursuing Sports Medicine fellowships next year: Dr. David Heath and Dr. JT Goodrum will attend UCLA Health and Lake Tahoe Sports Medicine Fellowship respectively.



Veterans Administration Division of Orthopaedic Surgery

Christina Brady, MD



We are pleased to announce the appointment of Dr. Christina Brady as the Section Chief of the Division of Orthopaedic Surgery at the VA Audie Murphy. Alongside the newly appointed Deputy Chief, Dr. R. Zachary Garza, they are determined to enhance access and improve the quality of care for the South Texas Veteran population. The VA Audie Murphy, which has been providing orthopaedic and musculoskeletal care to over 30,000 South Texas Veterans annually since its establishment in 1973, has expanded its surgical services through a collab-

oration with Christus Santa Rosa. This collaboration enables the offering of outpatient surgical cases through an ambulatory surgical center, greatly increasing outpatient accessibility to surgery for patients.



Led by Dr. Chance Moore, the esteemed head joint surgeon who holds a dual appointment with UT, the orthopaedic division has successfully introduced the option of outpatient total joint surgeries for eligible patients. This innovative approach has significantly improved patient care and accessibility. Furthermore, the team is excited to announce the establishment of the first VA Joints registry, an initiative aimed at tracking patient outcomes and advancing treatment protocols. As they look to the future, the division is dedicated to offering Veterans the option of robotic knee surgery, leveraging state-of-the-art technology to enhance surgical precision and outcomes, providing a cutting-edge surgical experience.

Education holds great importance in the mission of the VA Audie Murphy, and the orthopaedic division is privileged to train four orthopaedic residents, two PMR residents, and one family medicine resident as part of the VA rotation. The team of skilled orthopaedic surgeons, including Dr. Matthew Morrey, Dr. John Hinchey, Dr. Travis Burns, Dr. Siraj Sayeed, Dr. Dmitry Tuder, Dr. David Roberts, and Dr. John Chance, is dedicated to nurturing the growth and development of these residents. Together, they will continue to serve Veterans with excellence and compassion, upholding the highest standards of orthopaedic care.

Education holds great importance in the mission of the VA Audie Murphy, and the orthopaedic division is privileged to train four orthopaedic residents, two PMR residents, and one family medicine resident as part of the VA rotation. The team of skilled orthopaedic surgeons, including Dr. Matthew Morrey, Dr. John Hinchey, Dr. Travis Burns, Dr. Siraj Sayeed, Dr. Dmitry Tuder, Dr. David Roberts, and Dr. John Chance, is dedicated to nurturing the growth and development of these residents. Together, they will continue to serve Veterans with excellence and compassion, upholding the highest standards of orthopaedic care.



Orthopaedic Trauma

Boris A. Zelle, MD,
Chief of Orthopaedic Trauma

It has been another exciting year for the orthopaedic trauma division. The division of orthopaedic trauma continues to grow and remains the centerpiece of the clinical and academic mission of the orthopaedic department. Our team strives to provide excellent surgical care for a broad spectrum of injuries including high-energy injuries, ground-level falls, fragility fractures, and infections. Orthopaedic trauma continues to be the busiest division within the department and among the busiest surgical services within the UT system.

We are excited to welcome Dr. Case Martin as one of our new team members. Dr. Martin completed his residency at UT Health San Antonio and received fellowship training in orthopaedic trauma at Stanford University as well as Oxford, UK. He will join our faculty at the rank of Assistant Professor. He will bring a broad scope of practice to our division including orthopaedic trauma and joint replacement surgery. Dr. Martin will practice at several sites including the Methodist Healthcare System (MHS), the Baptist Health System (BHS), as well as our mothership, the University

Hospital Systems (UHS). He will join our team of excellent and skilled surgeons including Animesh Agarwal, Douglas Cromack, Anil Dutta, Thomas Hand, Ravi Karia, and Boris Zelle. We are also very enthusiastic about Jennah Hernandez, PA-C joining our great team of Physician Assistants. She will be a great addition to our outstanding team of trauma PAs which includes Priscilla Gomez-Ramos (PA-C), Christopher Delallo (PA-C), and John Kodosky (PA-C). Without the hard work and dedication of our trauma PAs our division would not be able to accomplish our mission.

The core of our clinical practice is centered at UHS, the only civilian level-1 trauma center in San Antonio, and one of the busiest trauma centers state- and nationwide. The great hospital support and the strong collaborations with other surgical and non-surgical services allow us to care for trauma patients who frequently present with multiple injuries and complex medical problems. We greatly appreciate the support from other services starting from patient admission in the emergency department, throughout the hospital stay, and during the post-injury rehabilitation. Besides our service to the University Hospital, we have further extended our trauma services to the San Antonio community. As spearheaded by Dr. Ravi Karia, we currently provide call coverage at Methodist Main, Methodist Metropolitan, Baptist Medical Center, North Central Baptist, as well as Mission Trail Baptist. We have greatly enjoyed expanding our footprint within the local hospitals, serving the community, and collaborating with local physicians. Our goal is to continue our expansion and to grow as a division.

Training the next generation of orthopaedic surgeons remains a central goal of our mission. On a daily basis, we train medical students, residents, and fellows rotating through our service. This includes our own UT residents as well as orthopaedic residents from the San Antonio Military Medical Center (SAMMC) as well as the Houston Methodist residency program. We feel that the high patient volume and the high level of injury complexity allow our residents to advance in their education, gain experience, and thrive as orthopaedic surgeons. In 2017, we established an orthopaedic trauma fellowship that has been accredited by the Orthopaedic Trauma Association (OTA). Within a relatively short amount of time, our fellowship evolved into a nationally top-tier training program. Our program provides the fellows with great exposure to high-energy injuries, pelvic and acetabular fractures, and peri-articular injuries. Our trauma fellows can expect to complete more than 800 operative cases per year with approximately 150 pelvis/acetabular surgeries. This caseload places our fellowship in the very top ranks of all accredited orthopaedic trauma fellowships in the nation. Besides acute trauma care, our fellows have the opportunity to develop additional trauma-related surgical skills, such as soft tissue reconstructions, knee ligament reconstructions, arthroplasty, or pediatric trauma. Our fellowship has remained highly competitive, and we consistently match one of our top-ranked candidates. In 2022, Kisan Parikh, as our most recent alumnus, gradu-

ated from our orthopaedic trauma fellowship after a stellar performance during his fellowship year. We feel honored and privileged that Drs. Thomas Hand (2019/2020), Shain Howard (2020/2021), Kisan Parikh (2021/2022), and Peter Wasky (2022/2023) chose to do their orthopaedic trauma fellowship at UT Health San Antonio. We are also looking forward to working with Dr. A. Reid Merwin from JPS at Fort Worth, TX as our incoming trauma fellow for 2023/2024.

We also feel blessed that our program has re-opened for national and international visitors. During 2022, we hosted Victor Veras from Sao Paulo, Brazil and Davy Sevilla also from Sao Paulo, Brazil as international visiting fellows. Moreover, we had the honor to welcome Dr. Eben Carroll from Wake Forest as a visiting professor. We are looking forward to revamping our international program, learning from the international orthopaedic community, and fostering relationships with our friends and colleagues from medical centers around the world.

The orthopaedic trauma division also takes a leadership role regarding clinical research. Currently, we enroll patients in five different clinical trials. These trials are funded through different mechanisms including industry, the Department of Defense (DoD), as well as the Pepper Center. Moreover, we remain prolific in publishing our research. Within the calendar year of 2022, the orthopaedic trauma division published a total of 11(!) journal manuscripts in the peer-reviewed literature (see publications below). A true highlight of the last year was the receipt of the 2022 Orthopaedic Trauma Association (OTA) DEI and Health Disparities Research Award. Dr. Boris Zelle was nominated for this national award by Dr. Animesh Agarwal. The award ceremony was held at the 2022 Annual Meeting of the OTA. In this context, we would also like to express our gratitude to the research team that is supporting our endeavors including all students, residents, fellows, and support staff, who all have played a significant role in the success of our research program. Special thanks to Rachel Pesek, RN, who recently retired after serving our division as a research nurse for almost ten years. Rachel has been crucial to our research operation, and we wish her all the best in her well-deserved retirement. Last, but not least, it must be emphasized that successful research cannot exist without successful collaborations. The orthopaedic trauma division is grateful to be connected with such a rich network of intramural collaborators including, but not limited to, the departments of emergency medicine, medicine, occupational therapy, pediatrics, physical therapy, and the Barshop Institute. Crucial extramural collaborations have been established with investigators from the University of Texas at San Antonio (UTSA), Dell School of Medicine in Austin, University of Zurich (Switzerland), and the San Antonio Military Medical Center (SAMMC).

We anticipate that in the years to come the orthopaedic trauma division will continue to play a leadership role in clinical excellence, education, and clinical research. We look forward to further expanding our program, training the next generation of orthopaedic surgeons, and contributing high-impact research.

Publications Trauma Division in 2022

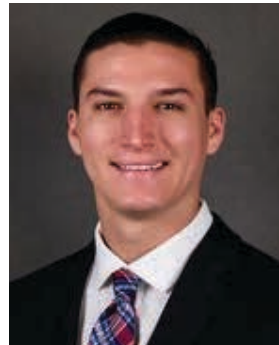
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UT Health San Antonio Orthopaedic Trauma Division Team Members 2022

Name	Degree	Position
Agarwal, Animesh	MD	Professor of Orthopaedics
Conti, Anna	BA	Administrative Assistant - Senior
Cromack, Douglas	MD	Professor of Orthopaedics and Plastic Surgery
Delallo, Christopher	PA-C	Physician Assistant
Dutta, Anil	MD	Associate Professor of Orthopaedics
Gomez-Ramos, Priscilla	PA-C	Physician Assistant
Gutierrez Naranjo, Jose Moises	MD	Research Fellow
Hand, Thomas	MD	Assistant Professor of Orthopaedics
Karia, Ravi	MD	Professor of Orthopaedics
Kodosky, John	PA-C	Physician Assistant
Martin, Case	MD	Assistant Professor of Orthopaedics
Moreno, Eduardo Valero	MD	Research Fellow
Pesek, Rachel	RN	Research Nurse
Zelle, Boris	MD	Professor of Orthopaedics



Dr. Case Martin joined the orthopaedic trauma division in October of 2022.



Dr. A. Reid Merwin orthopaedic trauma fellow 2023/2024.



Jennah Hernandez, PA-C joining the team.



Our great team of physician assistants Christopher Delallo (PA-C), Jennah Hernandez (PA-C), Priscilla Gomez-Ramos (PA-C), and John Kodosky (PA-C).



Dr. Boris Zelle, invited speaker at the SICOT World Congress in Kuala Lumpur, Malaysia in September of 2022.



Dr. Boris Zelle and Dr. Davy Sevilla, visiting fellow in November of 2022 from Sao Paulo, Brazil, during a tour of the Alamo.



Graduation of Dr. Kisan Parikh (orthopaedic trauma fellow 2021/2022) with his beautiful wife Amanda, baby Rajleigh and the orthopaedic trauma faculty.



Dr. Boris Zelle with Rachel Pesek, RN at her retirement reception.



Dr. Victor Veras, visiting fellow in September of 2022 from Sao Paulo, Brazil.



Visiting Professor Dr. Eben Carroll from Wake Forest with the orthopaedic trauma faculty and Peter Wasky (orthopaedic trauma fellow 2022/2023).



UHS, accredited level-1 trauma center.



Dr. Boris Zelle receiving the (OTA) DEI and Health Disparities Research Award from Dr. Brendan Patterson (OTA President), Dr. Michael Archdeacon (Immediate Past OTA President), as well as Dr. Animesh Agarwal, who nominated Dr. Zelle for this prestigious recognition.

Research Updates

Research Division



Boris A. Zelle, MD
Vice-Chair of Research

I feel honored to introduce the research section of the 2023 *San Antonio Orthopaedic Journal*. The Department of Orthopaedics continues to be prolific and produce high-impact research. In 2022, our department published over 50 peer-reviewed scientific journal manuscripts. Many of these articles were published in the top-tier orthopaedic journals. I would like to emphasize that the successful completion of a research project requires rigorous efforts along multiple steps that include protocol development, data collection, data analysis, as well as manuscript writing and submission. Therefore, we greatly appreciate the time and energy that our research staff, medical students, residents, fellows, and faculty put into the orthopaedic research program.

Successful research requires successful collaborations. We feel blessed to have the opportunity to work with a large network of intramural and extramural collaborators. Over the years, we have established very productive intramural collaborations with the departments of emergency medicine, medicine, neurosurgery, occupational therapy, pediatrics, physical therapy, and the Barshop Institute. Within the UT system, we also collaborate with investigators from the University of Texas at San Antonio (UTSA) as well as the Dell School of Medicine in Austin. We are also very grateful for our international collaborations with McMaster University in Hamilton, ON (Canada), University of Sao Paulo (Brazil), and the University of Zurich (Switzerland). Moreover, we continue to expand our collaborative efforts with the San Antonio Military Medical Center (SAMMC) and The San Antonio Orthopaedic Group (TSAOG).

Participation in multicenter trials has become an increased focus of our clinical research. Recently, our spine division as well as our arthroplasty division have made significant strides in establishing our center as a study site for various industry-sponsored trials. Similarly, the orthopaedic trauma division continues to participate in different industry-sponsored trials as well as randomized clinical trials that are funded by the Department of Defense (DoD). We are very grateful for the strong support that we have received from our study sponsors. Another clinical research focus will be on large databases and patient registries. Our center has recently become part of the American Joint Replacement Registry (AJRR), which contains data on over 3 million procedures including Patient-Reported Outcome Measures (PROMs). This involvement may provide

a great platform for upcoming research projects.

Our research endeavors also play an important role in our educational mission. Most articles published by our department are co-authored by medical students, residents, and fellows. Research participation remains an important element of orthopaedic residency training as it teaches the process of conducting research and how to interpret research papers. We were particularly proud of our performance at local resident research competitions. Our chief resident David Heath won the Albert Sanders/Roy Davis Resident Research Competition two years in a row in 2021 as well as 2022. Before that, our then chief resident Case Martin won the same competition in 2020.

We are excited about the multiple research accomplishments over the last year, and we are looking forward to more successful years to come. The Department of Orthopaedics is very grateful for all the strong support from our sponsors and collaborators, and we will continue to foster these relationships. This section will highlight the manuscripts and research papers published in 2022. We feel that the rich publication record speaks to our strong research efforts and academic success.



Clint Ulmer and Shane Bullock won the first and second prize at the 2023 Albert Sanders / Roy Davis Resident Research Competition



David Heath, winner of the 2022 Roy Davis Resident Research Competition.



Jose Gutierrez, Research Fellow, Winner of the Bradley Aust Resident Research Competition



Dr. Zelle with this year's Roy Davis contestants

Basic Science Division – A Year in Review



Vaida Glatt, PhD
Director of Basic Science Research

It is my pleasure to share our latest endeavors, progress, and accomplishments in the research division over the past year. The research team at the Glatt Lab has been heavily involved in scientific projects combining both engineering and biological approaches to develop novel treatment strategies for the regeneration and repair of bone. The team consists of an international scholar, research assistants, and medical students.

Since my lab moved to the Sam and Ann Barshop Institute for Longevity and Aging Studies, we've been working on the project "Targeting Senescent Cells to Prevent Chemotherapy-Induced Bone Loss in Aged Mice". This innovative project is using a completely new approach to prevent and revert chemotherapy-induced bone loss by exploring the use of senolytic drugs as a way to enhance the osteo-regenerative properties of aging bone and to recover osteo-degeneration that occurs as a result of chemotherapeutic regimens. The preliminary results of this study demonstrated that senolytic drugs can prevent and revert chemotherapy-induced bone loss in female and male mice. Importantly, this effect is more pronounced in aged mice compared to young.

My lab has been also working on a project entitled "Biomimetic Hematoma: Novel Carrier for the Delivery of Growth Factors to Enhance Bone Healing". This technology has multiple patents with international filings. The proprietary patent applications relate to the compositions and a novel treatment method comprising of a natural carrier, the Biomimetic Hematoma, that mimics the structural and biological properties of naturally healing fracture hematoma to deliver an extremely low dose of rhBMP-2 or other growth factors to patients with large segmental bone defects and non-union of fractures. These projects are being conducted jointly between my research team, and Animesh Agarwal, MD, who is an orthopedic trauma surgeon and the Chief of Orthopaedic Trauma Division for the Department of Orthopaedic Surgery at UTHSCSA. Preclinical small and large animal studies, as well as a small preliminary clinical study, have demonstrated that BH is currently the only known carrier able to effectively deliver much lower doses of rhBMP-2 with high efficiency, consistently and robustly initiating the bone repair cascade to successfully reconstruct complex bone fractures without side effects. Healing is initiated in these studies with an 80-90% reduced dose of rhBMP-2 compared to the lowest effective dose previously used with any other biomaterial scaffold. Over the next 12 months, further clinical studies including pa-

tients with nonunions, delayed unions, and large bone defects will be conducted to confirm the safety and efficacy of BH in collaboration with Stephen Quinnan, MD from the Paley Institute, West Palm Beach, FL, and Kevin Tetsworth, MD FRACS from the Royal Brisbane Hospital, Brisbane, Australia. Finally, we have been in talks with orthopaedic implant companies, and I am gearing up to start a company to raise money to develop this technology for clinical applications.

The Basic Science Research Division has been continuing collaborations regarding multidisciplinary projects on musculoskeletal research with collaborators on nearly every continent. For example, collaborations are ongoing with Mikhail Samchukov, MD, and Alexander Cherkashin, MD, from Texas Scottish Rite Hospital for Children, Dallas, TX, and Christopher Iobst, MD, Center for Limb Lengthening and Reconstruction, Nationwide Children's Hospital, Columbus, OH, on a project concerning the improvement and acceleration of bone healing and bone regenerate consolidation through the manipulation of the mechanical environment provided by implant stability using a large animal model. We submitted a revised manuscript to the *Journal of Bone and Joint Surgery*. Likewise, prospective studies at the Texas Scottish Rite Hospital for Children, as well as in the UK, South Africa, and Brazil are all underway based on optimizing and accelerating bone healing using the fixation stability of implants. Specifically, each will base their studies around Reverse Dynamization, which is a method previously invented by myself to accelerate the healing of fractures. Moreover, the Glatt Lab research team has continued our collaboration with Kevin Tetsworth, MD FRACS (Australia), who is an expert in limb salvage and reconstruction, to explore the biologic activity of Masquelet membranes as an aide to healing large bone defects.

In the past year, the Glatt Lab contributed 10 peer-reviewed publications to the orthopaedic literature and presented basic science and clinical research work at several national and international conferences. Furthermore, in 2022 I was an invited speaker and lecturer at the Vail Scientific Summit, CO, Cedars-Sinai Hospital, Orthopaedic Department, Los Angeles, CA, Controversies in Pediatric Limb Reconstruction at Texas Scottish Rite Hospital for Children, and others. Finally, our research division is involved in resident research which is focused on establishing a pathway to gain the experience needed to design clinical studies and write manuscripts.

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*Bench testing may not be indicative of clinical performance
† Compared to a nail without locking polymer
** Compared to nailing alone
*** In a poor quality foam model

Abstracts of Journal Manuscripts

Surgical treatment of proximal humerus fractures: a systematic review and meta-analysis

Erik Hohmann^{1,2,3}, Natalie Keough^{4,5}, Vaida Glatt^{6,7}, Kevin Tetsworth^{7,8,9,10}

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⁷Orthopaedic Research Centre of Australia, Brisbane, Australia.

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¹⁰Limb Reconstruction Center, Macquarie University Hospital, Macquarie Park, Australia.

Abstract

Introduction: The purpose of this study was to perform a systematic review and meta-analysis of both randomized controlled and observational studies comparing surgical interventions for proximal humerus fractures.

Methods: Systematic review of Medline, Embase, Scopus, and Google Scholar, including all level 1-3 studies from 2000 to 2022 comparing surgical treatment with ORIF, IM nailing, hemiarthroplasty, total and reverse shoulder arthroplasty (RTS) was conducted. Clinical outcome scores, range of motion (ROM), and complications were included. Risk of bias was assessed using the Cochrane Collaboration's ROB2 tool and ROBINS-I tool. The GRADE system was used to assess the overall quality of the body of evidence. Heterogeneity was assessed using χ^2 and I2 statistics.

Results: Thirty-five studies were included in the analysis. Twenty-five studies had a high risk of bias and were of low and very low quality. Comparisons between ORIF and hemiarthroplasty favored ORIF for clinical outcomes ($p = 0.0001$), abduction ($p = 0.002$), flexion ($p = 0.001$), and external rotation ($p = 0.007$). Comparisons between ORIF and IM nailing were not significant for clinical outcomes ($p = 0.0001$)

or ROM. Comparisons between ORIF and RTS were not significant for clinical outcomes ($p = 0.0001$) but favored RTS for flexion ($p = 0.02$) and external rotation ($p = 0.02$). Comparisons between hemiarthroplasty and RTS favored RTS for clinical outcomes ($p = 0.0001$), abduction ($p = 0.0001$), and flexion ($p = 0.0001$). Complication rates between groups were not significant for all comparisons.

Conclusions: This meta-analysis for surgical treatment of proximal humerus fractures demonstrated that ORIF is superior to hemiarthroplasty, ORIF is comparable to IM nailing, reverse shoulder arthroplasty is superior to hemiarthroplasty but comparable to ORIF with similar clinical outcomes, ROM, and complication rates. However, the study validity is compromised by high risk of bias and low level of certainty. The results should therefore be interpreted with caution. Ultimately, shared decision making should reflect the fracture characteristics, bone quality, individual surgeon's experience, the patient's functional demands, and patient expectations.

Level of evidence: Level III; systematic review and meta-analysis.

Increased Posterior Slope of the Medial and Lateral Meniscus Posterior Horn Is Associated With Anterior Cruciate Ligament Injuries

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Abstract

Purpose: To measure the slope of the medial and lateral posterior horn of the meniscus and its contribution to the overall resulting posterior tibial slope (bone and meniscus combined slope) in anterior cruciate ligament-intact (ACLI) and -deficient (ACLD) knees.

Methods: Magnetic resonance images of intact menisci in patients 16 to 60 years old were included. Posterior tibial bone slope (PTS) and meniscus slope (MS) were measured 25%, 50%, and 75% from the medial and lateral borders of the tibial plateau. Analysis of variance was used to determine differences in posterior tibial slopes between ACLD and ACLI knees and between sexes for ACLD and ACLI knees.

Results: 192 ACLI patients (age 35.2 ± 9.6 years, mean \pm standard deviation) and 159 ACLD patients (age 34.2 ± 10.3 years) were included. Medial and lateral PTS in ACLD was significantly ($P = .00001$) higher at 25%, 50%, and 75%. Medial and lateral MS in ACLD was significantly ($P = .00001$)

lower at 25%, 50%, and 75%. There were no significant sex differences for medial or lateral MS in ACLD or ACLI patients ($P = .51$). The resultant combined medial and lateral slope in ACLD patients was significantly ($P = .00001$) lower at 25%, 50%, and 75%. There were no significant sex differences in PTS ($P = .68$), MS ($P = .51$), or resultant slope ($P = .79$).

CONCLUSIONS: The results of this study strongly suggest that lower meniscal slopes of both the medial and lateral posterior horns are associated with ACL injuries in both males and females. Although the posterior horns reversed the bone PTS to an anterior inclined slope in both ACLD and ACLI patients, both the meniscus slope and the combined resultant slope were significantly lower and more positive at all 6 measured locations in ACLD knees.

Level of evidence: III, retrospective cohort study.

Fracture hematoma micro-architecture influences transcriptional profile and plays a crucial role in determining bone healing outcomes

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Abstract

The hematoma that forms between broken fragments of bone serves as a natural fibrin scaffold, and its removal from the defect site delays bone healing. The hypothesis of this study is that the microarchitectural and mechanical properties of the initially formed hematoma has a significant effect on the regulation of the biological process, which ultimately determines the outcome of bone healing. To mimic three healing conditions in the rat femur (normal, delayed, and non-healing bone defects), three different defect sizes of 0.5, 1.5, and 5.0 mm, are respectively used. The analysis of 3-day-old hematomas demonstrates clear differences in fibrin clot micro-architecture in terms of fiber diameter, fiber density, and porosity

of the formed fibrin network, which result in different mechanical properties (stiffness) of the hematoma in each model. Those differences directly affect the biological processes involved. Specifically, RNA-sequencing reveals almost 700 differentially expressed genes between normally healing and non-healing defects, including significantly up-regulated essential osteogenic genes in normally healing defects, also differences in immune cell populations, activated osteogenic transcriptional regulators as well as potential novel marker genes. Most importantly, this study demonstrates that the healing outcome has already been determined during the hematoma phase of bone healing, three days post-surgery.

Three-stage limb salvage in tibial fracture related infection with composite bone and soft-tissue defect

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Abstract

Introduction: Managing critical-sized tibial defects is one of the most complex challenges orthopedic surgeons face. This is even more problematic in the presence of infection and soft-tissue loss. The purpose of this study is to describe a comprehensive three-stage surgical protocol for the reconstruction of infected tibial injuries with combined bone defects and soft-tissue loss, and report the clinical outcomes.

Materials and methods: A retrospective study at a specialized limb reconstruction center identified all patients with infected tibial injuries with bone and soft-tissue loss from 2010 through 2018. Thirty-one patients were included. All cases were treated using a three-stage protocol: (1) infected limb damage control; (2) soft-tissue coverage with a vascularized or local flap; (3) definitive bone reconstruction using distraction osteogenesis principles with external fixation.

Primary outcomes: limb salvage rate and infection eradication.

Secondary outcomes: patient functional outcomes and satisfaction.

Results: Patients in this series of chronically infected tibiae

had been operated upon 3.4 times on average before starting our limb salvage protocol. The mean soft-tissue and bone defect sizes were 124 cm² (6-600) and 5.4 cm (1-23), respectively. A free flap was performed in 67.7% (21/31) of the cases; bone transport was the selected bone-reconstructive option in 51.7% (15/31). Local flap failure rate was 30% (3/10), with 9.5% for free flaps (2/21). Limb salvage rate was 93.5% (29/31), with infection eradicated in all salvaged limbs. ASA-MI bone score: 100% good/excellent. Mean VAS score was 1.0, and ASAMI functional score was good/excellent in 86% of cases. Return-to-work rate was 83%; 86% were "very satisfied" with the treatment outcome.

Conclusion: A three-stage surgical approach to treat chronically infected tibial injuries with combined bone and soft-tissue defects yields high rates of infection eradication and successful limb salvage, with favorable functional outcomes and patient satisfaction.

Subacromial Decompression in Patients With Shoulder Impingement With an Intact Rotator Cuff: An Expert Consensus Statement Using the Modified Delphi Technique Comparing North American to European Shoulder Surgeons

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Abstract

Purpose: To perform a Delphi consensus for the treatment of patients with shoulder impingement with intact rotator cuff tendons, comparing North American with European shoulder surgeon preferences.

Methods: Nineteen surgeons from North America (North American panel [NAP]) and 18 surgeons from Europe (European panel [EP]) agreed to participate and answered 10 open-ended questions in rounds 1 and 2. The results of the first 2 rounds were used to develop a Likert-style questionnaire for round 3. If agreement at round 3 was $\leq 60\%$ for an item, the results were carried forward into round 4. For round 4, the panel members outside consensus ($>60\%$, $<80\%$) were contacted and asked to review their response. The level of agreement and consensus was defined as 80%.

Results: There was agreement on the following items: impingement is a clinical diagnosis; a combination of clinical tests should be used; other pain generators must be excluded; radiographs must be part of the workup; magnetic resonance

imaging is helpful; the first line of treatment should always be physiotherapy; a corticosteroid injection is helpful in reducing symptoms; indication for surgery is failure of nonoperative treatment for a minimum of 6 months. The NAP was likely to routinely prescribe nonsteroidal anti-inflammatory drugs (NAP 89%; EP 35%) and consider steroids for impingement (NAP 89%; EP 65%).

Conclusions: Consensus was achieved for 16 of the 71 Likert items: impingement is a clinical diagnosis and a combination of clinical tests should be used. The first line of treatment should always be physiotherapy, and a corticosteroid injection can be helpful in reducing symptoms. The indication for surgery is failure of no-operative treatment for a minimum of 6 months. The panel also agreed that subacromial decompression is a good choice for shoulder impingement if there is evidence of mechanical impingement with pain not responding to nonsurgical measures.

Level of evidence: Level V, expert opinion.

Biomechanical Studies for Glenoid Based Labral Repairs With Suture Anchors Do Not Use Consistent Testing Methods: A Critical Systematic Review

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Abstract

Purpose: The purpose of this systematic review was to investigate variability in biomechanical testing protocols for laboratory-based studies using suture anchors for glenohumeral shoulder instability and SLAP lesion repair.

Methods: A systematic review of Medline, Embase, Scopus, and Google Scholar using Covidence software was performed for all biomechanical studies investigating labral-based suture anchor repair for shoulder instability and SLAP lesions. Clinical studies, technical notes or surgical technique descriptions, or studies treating glenoid bone loss or capsulorrhaphy were excluded. Risk of bias (ROB) was assessed with the ROB-INS-I tool. Study quality was assessed with the Quality Appraisal for Cadaveric Studies. Heterogeneity was assessed with the I² statistic.

Results: A total of 41 studies were included. ROB was serious and critical in 27 studies, moderate in 13, and low in 1; 6 studies had high quality, 21 good quality, 10 moderate quality, 2 low quality, and 2 very low quality. Thirty-one studies used

and 22 studies included cyclic loading. Angle of anchor insertion was reported by 33 studies. The force vector for displacement varied. The most common directions were perpendicular to the glenoid (n = 9), and anteroinferior or anterior (n = 8). The most common outcome measures were load to failure (n = 35), failure mode (n = 23), and stiffness (n = 21). Other outcome measures included load at displacement, displacement at failure, tensile load at displacement, translation, energy absorbed, cycles to failure, contact pressure, and elongation.

Conclusion: This systematic review demonstrated a clear lack of consistency in those cadaver studies that investigated biomechanical properties after surgical repair with suture anchors for shoulder instability and SLAP lesions. Testing methods between studies varied substantially with no universally applied standard for preloading, load to failure and cyclic loading protocols, insertion angles of suture anchors, or direction of loading. To allow comparability between studies standardization of testing protocols is strongly recommended.

Socioeconomic status does not change decision-making in the treatment of distal radius fractures at a level 1 trauma center

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Abstract

Objectives: To compare operative rates, total hospital charges, and length of stay between different socioeconomic cohorts in treating distal radius fractures (DRFs).

Design: A retrospective cohort study.

Setting: Large public level 1 trauma center.

Patients: A retrospective search of all trauma activations over a 7-year period (2013-2020) yielded 816 adult patients diagnosed with DRF. Patients were separated into cohorts of socioeconomic status based on 2010 US Census data and insurance status.

Intervention: DRFs were treated either nonoperatively using closed reduction and splinting or operatively using open reduction and internal fixation, closed reduction percutaneous pinning, or external fixator application.

Main outcome measurements: Operative rates of DRF, total hospital charges, and length of stay.

Results: Patients who were uninsured or in the low-in-

come socioeconomic cohort had no significant difference in operative rates, total hospital costs, or length of stay when compared with their respective insured or standard income groups. Younger patients and those with OTA/AO type C, bilateral, or open DRFs were more likely to undergo operative intervention.

Conclusions: This study demonstrates that low socioeconomic status based on annual household income and insurance status was not associated with differences in operative rates on DRFs, length of stay, or total hospital charges. These results suggest that outcome disparities between groups may be caused by postoperative differences rather than treatment decision-making. Although this study investigates access to surgical care at a publicly funded level 1 trauma center, disparities may still exist in other models of care.

Level of evidence: Prognostic Level III.

Full versus Baby Dose Aspirin for Antithrombotic Prophylaxis in Free Tissue Transfer: Does Size Matter?

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Abstract

The postoperative prophylactic use of aspirin is a common practice among plastic surgeons after free tissue transfer. The use of baby aspirin (81 mg) has become more popular due to previously published literature in other fields. We hypothesized that a full dose daily aspirin is nonsuperior to a baby dose daily aspirin in preventing arterial thrombosis in free tissue transfer.

Methods: All patients undergoing free tissue transfer of the extremities from 2008 to 2020 were retrospectively reviewed. They were divided into two groups based on the postoperative dose of aspirin administered (full versus baby dose). The decision to administer full or baby dose was based on the surgeon's preference. Primary outcome was revision of the arterial anastomosis. Secondary outcomes included flap complications.

Results: A total of 183 patients were identified. Out of those, 78 patients received full dose aspirin postoperatively, whereas 105 received a baby dose of aspirin. Patients who received baby aspirin did not have a higher incidence of returning to the operating room for revision of their arterial anastomosis [7.6% versus 7.7%; adjusted odds ratio, 0.93 (95% confidence interval, 0.28-3.11); adjusted P, 0.906]. No differences were found between the two groups in complete and partial flap loss, wound dehiscence, or infection. None of the patients experienced any aspirin-related gastrointestinal complications.

Conclusions: In patients undergoing free tissue transfer, thrombosis of the arterial anastomosis is rare. Administration of a full dose of aspirin postoperatively was not superior to a baby dose of aspirin in preventing arterial-related complications.

Use of Clindamycin for Necrotizing Soft Tissue Infection Decreases Amputation Rate

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Abstract

Objective: To identify the impact of clindamycin use on mortality and amputation rates in patients with necrotizing fasciitis.

Design: Retrospective review.

Setting: Level 1 trauma center, single-center study.

Patients/participants: All patients from 2008 to 2019 with a diagnosis of necrotizing fasciitis. One hundred ninety patients were included in statistical analysis.

Intervention: Use of clindamycin in the initial antibiotic regimen in the treatment of necrotizing soft tissue infection.

Main outcome measurements: Amputation and mortality rates.

Results: Patients who received clindamycin had 2.92 times reduced odds of having an amputation when compared with their counterparts, even when American Society of Anesthe-

siologist scores, comorbidities, smoking, drug use, alcohol consumption, race, ethnicity, sex, and age were controlled for and regardless of other antibiotics started ($P = 0.015$). There was no significant difference in mortality rate between those patients who did and did not receive clindamycin as part of their initial antibiotic regimen (8.3% vs. 11.6%, respectively; $P = 0.453$).

Conclusion: The use of clindamycin in the initial antibiotic regimen for treatment of NSTI was shown to significantly decrease rates of amputation but not mortality.

Level of evidence: Therapeutic Level III. See Instructions for Authors for a complete description of levels of evidence.

Providing Orthopaedic Care to Vulnerably Underserved Patients: AOA Critical Issues

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Abstract

Implementation of the Affordable Care Act has increased the number of Americans with health insurance. However, a substantial portion of the population is still considered underserved, including those who are uninsured, underinsured, and those who are enrolled in Medicaid. The patients frequently face substantial access-to-care issues. Many underlying social

determinants of health impact this vulnerable, underserved population, and surgeons must understand the nuances of caring for the underserved. There are numerous opportunities to engage with this population and providing care to the indigent can be rewarding for both the vulnerably underserved patient and their surgeon.

Subungual Exostosis of the Hand: A Case Report in a 5-Year-Old Boy and Literature Review

Meagan E Womack ¹, Olivia J Fisher, Matthew R Landrum, Ryan A Rose

Abstract

Subungual exostosis is a relatively uncommon benign tumor that occurs at the distal end of the distal phalanx of the toes and rarely the hands. We present in this article a review of the currently published English literature and provide a case report of a 5 year old male with subungual exostosis of the thumb. A 5 year old male presented with a slow growing mass of the distal dorsal aspect of the left thumb. Radiographs showed dorsal calcifications on the thumb. Surgical removal of the mass and histopathological analysis was performed supporting a diagnosis of subungual exostosis. Post-operatively, the patient had complete excision of the mass, normal

nail morphology, no reoccurrence, and no post-surgical complications. Subungual exostosis remains a rare entity especially in the upper extremity. Its cause is not fully understood, nor is there an agreed upon method of treatment. However, with careful dissection during surgical removal good outcomes can be obtained. To our knowledge, this is the largest literature review on subungual exostosis and our case report is an uncommon presentation in the youngest reported male patient. It is our hope that this literature review and case report lend to increased awareness of subungual exostosis and how to diagnose and treat this lesion.

Incisional and Surrounding Periarticular Soft Tissue Management With Negative Pressure Therapy

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Abstract

Periarticular injuries of the lower extremity are known for wound healing and infection complications. The role for incisional negative pressure wound therapy for lower extremity periarticular fractures has expanded over the last 10 years in hopes of minimizing complications. To date, there is no standardized published protocol of how negative pressure wound

therapy is best used in lower extremity periarticular fractures. A review of strategies to decrease complications associated with the operative management of lower extremity periarticular fractures to include the use of incisional negative pressure wound therapy is presented.

Long-term analysis of chronic pain associated with lower extremity injuries

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Abstract

Introduction: The main objective of this study is to examine chronic pain and limping in relation to lower extremity and pelvic fracture location in addition to fracture combinations if multiple fractures are present on the same leg that have not been previously reported. We hypothesize that fracture pattern and location of lower extremity and pelvis fractures of multiple injured patients influence their long-term pain outcome.

Materials and methods: Retrospective cohort study. Patients with treated multiple lower limb and pelvic fractures at a level I trauma center and followed up for at least 10 years postinjury were assessed. Lower leg pain subdivided into persistent, load-dependent and intermittent pain, as well as limping were recorded by using self-administered patient questionnaires and standardized physical examinations performed by a trauma surgeon. Descriptive statistics were used to present comparative measurements between groups.

Results: Fifty-seven percent of patients (n = 301) showed chronic lower limb pain 10 years postinjury. Ten percent of

all patients with chronic pain displayed persistent pain, and here the most common fracture combination was tibial shaft fractures in combination with femoral shaft or proximal tibial fractures (13%). One hundred fifty-one patients reported load-dependent pain, with the most common fracture combinations being fractures of the foot in combination with femoral shaft fractures or distal tibial fractures (11%). One hundred twenty patients reported intermittent pain, with the most common fracture combinations involving the shaft of the tibia with either the femoral shaft or distal tibia (9%). Two hundred fifteen patients showed a persistent limp, and here the most common fractures were fractures of the femoral shaft (19%), tibial shaft (17%), and pelvis (15%).

Conclusions: In multiple injured patients with lower extremity injuries, the combination of fractures and their location are critical factors in long-term outcome. Patients with chronic persistent or load-dependent pain often had underlying femoral shaft fractures in combination with joint fractures.

Do superficial infections increase the risk of deep infections in tibial plateau and plafond fractures?

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Abstract

Purpose: Open reduction internal fixation of tibial plateau and pilon fractures may be complicated by deep surgical site infection requiring operative debridement and antibiotic therapy. The management of superficial surgical site infection is controversial. We sought to determine whether superficial infection is associated with an increased risk of deep infection requiring surgical debridement after fixation of tibial plateau and pilon fractures.

Methods: This is a secondary analysis of data from the VANCO trial, which included 980 adult patients with a tibial plateau or pilon fracture at elevated risk of infection who underwent open reduction internal fixation with plates and screws with or without intrawound vancomycin powder. An association of superficial surgical site infection with deep surgical site infection requiring debridement surgery and antibiotics was explored after matching on risk factors for deep surgical site infection.

Results: Of the 980 patients, we observed 30 superficial infections (3.1%) and 76 deep infections (7.8%). Among patients who developed a superficial infection, the unadjusted incidence of developing a deep infection within 90 days was 12.8% (95% confidence interval [CI] 1.3-24.2%). However, after a 3:1 match on infection risk factors, the 90-day marginal probability of a deep surgical site infection after sustaining a superficial infection was 6.0% (95% CI - 6.5-18.5%, $p = 0.35$).

Conclusion: Deep infection after superficial infection is uncommon following operative fixation of tibial plateau and pilon fractures. Increased risk of subsequent deep infection attributable to superficial infection was inconclusive in these data.

Level of evidence: Prognostic Level II.

How Can Negative Pressure Wound Therapy Pay for Itself?-Reducing Complications Is Important

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Abstract

Introduction: Orthopaedic trauma demonstrates a relatively high rate of surgical site infections (SSI) as compared with other surgical specialties. SSIs provide significant clinical challenges and create significant health care costs. Incisional negative pressure wound therapy (iNPWT) has reduced the risk of SSI in orthopaedic surgery and other surgical specialties.

Purpose: The purpose of this study is to investigate potential cost savings with the use of iNPWT (3M Prevena Therapy, 3M, St. Paul, MN) in high-risk orthopaedic trauma patients with closed OTA/AO 41C and 43C fractures.

Methods: This is a retrospective cohort study performed at a single, level-1 trauma center using data from a lower extremity fracture registry. Using the results from the registry and baseline infection rates derived from the literature, a health

economic model was developed to evaluate the potential cost savings.

Results: A total of 79 patients included in the registry underwent open reduction and internal fixation of OTA/AO 41C and 43C fractures. A total of 10.1% developed a SSI. For those who received iNPWT, the rate of SSI was 7.4%. A health economic model suggests that the use of iNPWT may reduce the costs per patient by approximately \$1381 to \$4436 per patient.

Conclusions: This health economic assessment and model suggests that judicious use of iNPWT may reduce health care costs in patients undergoing open reduction and internal fixation of OTA/AO 41C and 43C fractures.

Level of evidence: Economic Level IV.

Post-traumatic growth in polytraumatized patients after 20+ years: a long-term follow-up study of 337 patients treated at a level 1 trauma center

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Abstract

Purpose: There is limited research on the long-term psychiatric outcomes of polytraumatized patients. Existing studies focus mainly on the negative sequelae. Post-traumatic growth (PTG) describes positive personal development after severe physical or mental distress. In this study, we investigated post-traumatic growth in polytraumatized patients at least 20 years after trauma.

Methods: Patients treated for polytrauma at a German level 1 trauma center between 1971 and 1990, were contacted 20+ years later. A questionnaire with 37 questions from the stress-related growth scale (SRGS) and the post-traumatic growth inventory (PGI) was administered. PTG was quantified in five specific areas. PTG and patient demographics were then analyzed using logistic regression.

Results: Eligible questionnaires were returned by 337 patients. 96.5% of patients reported improvements regarding at least one of the 37 questions. Approximately, a third of

patients noticed distinct improvements regarding their relationship to others (29.2%), appreciation of life (36.2%) and attitudes towards new possibilities (32.5%). Patient demographics were significant predictors for the development of PTG: Older ($p < 0.001$), female ($p = 0.042$) and married patients ($p = 0.047$) showed a greater expression of PTG. We also saw significantly more PTG in patients with higher injury severity ($p = 0.033$).

Conclusion: 20 years after polytrauma, patients report improvements in their relationship with others, appreciation of life and attitude towards new possibilities. Women and married patients show higher expression of PTG. Furthermore, there is higher expression of PTG with higher age and injury severity. Post-traumatic growth should be identified and fostered in clinical practice.

Level of evidence: III-prospective long-term follow-up study.

The local soft tissue status and the prediction of local complications following fractures of the ankle region

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Abstract

Introduction: Well-known risk factors (RF) for soft tissue complications following surgical treatment of fracture of the ankle region include diabetes, smoking, and the local soft tissue status. A weighted analysis might provide a risk profile that guides the surgical treatment strategy. The aim of this meta-analysis was to provide a risk profile for soft tissue complications following closed fractures of the ankle region.

Methods: This review provides a meta-analysis of studies that investigate potential risk factors for complications in fractures of the ankle region.

Inclusion criteria: Original articles that were published between 2000 and 2020 in English or German language that calculated odds ratios (OR) of RF for soft tissue complications. Further, this study only includes articles that investigated fractures of the ankle region including pilon fracture, calcaneal fractures, and fractures of the malleoli. This study excluded articles that provide exploratory analyses, narrative reviews, and case reports. RF were stratified as patient specific systemic RF (PSS), patient specific local RF (PSL), and non-patient specific RF (NPS). PSS RF includes comorbidities, American society of anaesthesiology (ASA), requirement of medication, additional injuries, and smoking or substance abuse. PSL RF includes soft tissue status, wounds, and associated complications. NPS RF includes duration of surgery, staged

procedure, or time to definitive surgery. Random effect (RE) models were utilized to summarize the effect measure (OR) for each group or specific RF.

Results: Out of 1352 unique articles, 34 were included for quantitative analyses. Out of 370 complications, the most commonly assessed RF were comorbidities (34.6%). Local soft tissue status accounted for 7.5% of all complications. The overall rate for complication was 10.9% (standard deviation, SD 8.7%). PSS RF had an OR of 1.04 (95%CI 1.01 to 1.06, $p = 0.006$), PSL an OR of 1.79 (95% 1.28 to 2.49, $p = 0.0006$), and NPS RF an OR of 1.01 (95%CI 0.97 to 1.05, $p = 0.595$). Additional injuries did not predict complications (OR 1.23, 95%CI 0.44 to 3.45, $p = 0.516$). The most predictive RF were open fracture (OR 3.47, 95%CI 1.64 to 7.34, $p < 0.001$), followed by local tissue damage (OR 3.05, 95%CI 1.23 to 40.92, $p = 0.04$), and diabetes (OR 2.3, 95%CI 1.1 to 4.79, $p = 0.26$).

Conclusion: Among all RFs for regional soft tissue complications, the most predictive is the local soft tissue status, while additional injuries or NPS RF were less predictive. The soft tissue damage can be quantified and outweighs the cofactors described in previous publications. The soft tissue status appears to have a more important role in the decision making of the treatment strategy when compared with comorbidities such as diabetes.

Surgical treatment options for femoral neck fractures in the elderly

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Abstract

This review paper on femoral neck fractures in the elderly provides updated information from the most recent literature and examines the advantages and disadvantages of different surgical treatment options. Femoral neck fractures are a common injury that many orthopaedic surgeons will encounter within their practice. These injuries are associated with significant morbidity, and the economic impact of surgically fixing these fractures is notable. Contemporary treatment options include internal fixation, hemiarthroplasty, and total hip arthroplasty. For non-displaced fractures, both internal fixation and hemiarthroplasty remain feasible options. Hemiarthroplasty decreases re-operation rate, while internal fixation decreases

operative time, blood loss, and infection risk. Newly designed fixation constructs require further investigation. For displaced fractures, the literature strongly supports arthroplasty. Most elderly patients with displaced femoral neck fractures should be managed with a hemiarthroplasty. In select active elderly patients, total hip arthroplasty may achieve favourable early functional outcomes as compared to a hemiarthroplasty. Finally, cemented arthroplasty decreases periprosthetic fracture risk as compared to cementless arthroplasty. However, experienced arthroplasty surgeons with significant expertise in press-fitting techniques may achieve similar outcomes with cementless arthroplasty.

Risk of Surgical Site Infections in OTA/AO Type C Tibial Plateau and Tibial Plafond Fractures: A Systematic Review and Meta-Analysis

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Abstract

Objectives: To analyze the current incidence of postoperative infection for OTA/AO type C fractures of the tibial plateau and tibial plafond.

Data sources: Three medical databases: PubMed/MEDLINE, ScienceDirect, and the Cochrane Library, were used in our systematic literature search. Search results were restricted to articles transcribed in English/Spanish and publication date after January 1, 2000, to present day.

Study selection: Inclusion criteria were studies reporting postoperative infection data for OTA/AO type 41C, 43C, or equivalent fractures of skeletally mature individuals. A minimum of 6 total fractures of interest and a frequency of 75% overall were required. Studies reporting on pathologic fractures, stress fractures, or low-energy fracture types were excluded.

Data extraction: Two authors independently screened abstracts, evaluated full-text manuscripts, and extracted relevant data from included studies. Any instances of discrepancy

were resolved within the study committee by consensus.

Data synthesis: Outcomes were expressed using direct proportions (PR) with a 95% confidence interval. The effects of comorbidities on infection rates were reported using odds ratios with a 95% confidence interval. All analyses used a DerSimonian-Laird estimate with a random-effects model based on heterogeneity. The presence of publication bias was evaluated using funnel plots and Egger's tests.

Conclusions: Patients with these specific fractures develop infections at a notable frequency. The rates of deep infections were approximately 6% in tibial plateau fractures and 9% in tibial plafond fractures. These results may be useful as a reference for patient counseling and other future studies aimed at minimizing postoperative infection for these injuries.

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

CORR Insights®: Ninety-Day Follow-up Is Inadequate for Diagnosis of Fracture-related Infections in Patients with Open Fractures

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No abstract available

Obesity Increases Time to Union in Surgically Treated Pediatric Fracture Patients

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Abstract

Introduction: To determine whether obesity affects time to radiographic union in surgically treated pediatric extremity fractures.

Methods: A retrospective review of pediatric patients with extremity fractures at a Level 1 trauma center from 2010 to 2020. Those treated conservatively and patients with non-unions were excluded. Union was defined as radiographic evidence of bridging callus on all sides of the fracture and absence of the previous fracture line.

Results: Obese patients had a markedly increased time to

union when compared with others, even when age, sex, fracture type, race, and ethnicity were controlled for. The mean time to union for obese and nonobese patients were 152 and 93.59 days, respectively ($P < 0.001$). Obese patients had 3.39 times increased odds of having increased time to union. Obese patients had 6.64 times increased odds of having fractures with delayed union of 4 months or greater ($P < 0.001$).

Conclusions: There is a positive correlation between obesity and time to union in surgically treated pediatric fracture patients.

Osteochondroma of the Tibial Tubercle Masquerading as Osgood-Schlatter Disease: A Case Report

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Abstract

Background: Osteochondromas are a relatively common primary bone tumor, which may share common clinical features with Osgood-Schlatter disease (OSD). A limited number of cases have described tumors misdiagnosed as OSD.

Case presentation: We report the case of an 11-year-old male with a sessile osteochondroma of the tibial tubercle and concomitant involvement of the distal extension and attachment of the patellar tendon into the tibial periosteum. A prior di-

agnosis OSD had been made. The lesion was resected and repair of the extensor mechanism was required at the time of surgery. The patient was followed for 20 months postoperatively and had restoration of knee function with minimal pain, as demonstrated by a PEDI-IKDC score of 94.6 at 19-month.

Conclusion: This is a rarely reported case of benign tumor masquerading as OSD requiring excisional biopsy with extensor mechanism repair.

Thoracic Curve Correction Ratio: An Objective Measure to Guide against Overcorrection of a Main Thoracic Curve in the Setting of a Structural Proximal Thoracic Curve

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Abstract

Purpose: The correction of double thoracic (Lenke 2) curves has been associated with higher rates of postoperative shoulder imbalance that may compromise long-term outcomes following spinal deformity correction. A number of methods have been proposed to mitigate this risk, though no accepted standard measurement exists. The purpose of this study is to validate a novel quantitative method of determining the relative curve correction magnitude in double thoracic curves.

Methods: Retrospective data from a multi-center database of patients undergoing surgical correction of left-proximal thoracic, right-main thoracic Lenke 2 curves were analyzed. A novel measurement tool, the Thoracic Curve Correction Ratio (TCCR), was applied for the purposes of validation against historical data.

Results: A total of 305 patients with complete two-year follow-up data were included. The TCCR, or the ratio of postoperative percent correction of the thoracic curves divided by the ratio of the preoperative curve magnitudes, displayed a significant negative correlation (Pearson $R = -0.66$; $p < 0.001$) with T1 tilt at two years postoperatively.

Conclusions: The TCCR could be added as an important factor in the preoperative planning process and intraoperative assessment in order to reduce postoperative T1 tilt. While T1 tilt remains an imperfect surrogate measure for clinical shoulder balance, it serves as one of many potential measures that the surgeon may evaluate quantitatively and radiographically.

Does nutrition consultation in the year leading up to neuromuscular scoliosis surgery result in significant weight gain, or just a larger magnitude curve?

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Abstract

Purpose: Patients with neuromuscular scoliosis undergoing posterior instrumented spinal fusion can be underweight, malnourished, and have higher complication rates. A nutrition consult is common in this population and it is unclear if weight gain occurs from the consult or surgery. The purpose of the study was to determine if nutrition consultation in the year prior to spinal fusion resulted in significant differences in weight gain or percentile on the CP growth chart. The secondary aim was to determine if there would be deformity progression during that time.

Methods: Retrospective chart and radiograph review was performed for all patients with neuromuscular spinal deformity treated with posterior instrumented spinal fusion at one institution between January 1, 2009 and August 1, 2015. Inclusion criteria included < 20 years old, diagnosis of neuromuscular scoliosis, and 1-year pre-operative percentile on the CP growth chart < 50. Patient demographics, GMFCS level, weight, percentile on appropriate CP growth chart, major curve and pelvic obliquity at 1 year pre-operatively and at surgery were recorded.

Results: Sixty-eight patients met inclusion criteria. Thirty-seven patients had a nutrition appointment within 1 year

pre-operatively, 31 patients did not. There were no significant differences between the groups when comparing increase in weight ($p = 0.9$), percentile on CP growth charts ($p = 0.3$), major deformity ($p = 0.1$), and pelvic obliquity ($p = 0.2$). Overall, there was a mean 3.2 kg weight gain, 5.2% increase on CP growth charts, 40° increase in major curve, and 5° worsening of pelvic obliquity in the year before surgery. There was an average overall increase in the pre-operative albumin value, but this was not different between groups ($p = 0.6$). Children who were tube fed gained on average 10.8 percentiles on the CP growth chart, whereas children without gained only 0.5 percentiles ($p = 0.002$).

Conclusions: Nutrition consultations in the year preceding posterior instrumented spinal fusion do not lead to weight optimization prior to surgery in comparison to patients without nutrition consults. Gastrostomy tubes were found to be helpful for weight optimization and should be considered as an alternative nutrition option in pre-operative planning in underweight patients.

Level of evidence: III-therapeutic study; retrospective comparative study.

Variability in evaluation and treatment of tibial tubercle fractures among pediatric orthopedic surgeons

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Abstract

The purpose of this study was to determine the variability in clinical management of tibial tubercle fractures among a group of pediatric orthopedic surgeons. Nine fellowship-trained academic pediatric orthopedic surgeons reviewed 51 anteroposterior and lateral knee radiographs with associated case age. Respondents were asked to describe each fracture using the Ogden classification (type 1-5 with A/B modifiers), desired radiographic workup, operative vs. nonoperative treatment strategy and plans for post-treatment follow-up. Fair agreement was reached when classifying the fracture type using the Ogden classification ($k = 0.39$; $P < 0.001$). Overall, surgeons had a moderate agreement on whether to treat the fractures operatively vs. nonoperatively ($k = 0.51$; $P < 0.001$). Nonoperative management was selected for 80.4% (45/56) of type 1A fractures. Respondents selected operative treatment for 75% (30/40) of type 1B, 58.3% (14/24) of type 2A, 97.4%

(74/76) of type 2B, 90.7% (39/43) of type 3A, 96.3% (79/82) of type 3B, 71.9% (87/121) of type 4 and 94.1% (16/17) of type 5 fractures. Regarding operative treatment, fair/slight agreement was reached when selecting the specifics of operative treatment including surgical fixation technique ($k = 0.25$; $P < 0.001$), screw type ($k = 0.26$; $P < 0.001$), screw size ($k = 0.08$; $P < 0.001$), use of washers ($k = 0.21$; $P < 0.001$) and performing a prophylactic anterior compartment fasciotomy ($k = 0.20$; $P < 0.001$). Furthermore, surgeons had fair/moderate agreement regarding the specifics of nonoperative treatment including degree of knee extension during immobilization ($k = 0.46$; $P < 0.001$), length of immobilization ($k = 0.34$; $P < 0.001$), post-treatment weight bearing status ($k = 0.30$; $P < 0.001$) and post-treatment rehabilitation ($k = 0.34$; $P < 0.001$). Significant variability exists between surgeons when evaluating and treating pediatric tibial tubercle fractures.

The impact of segmental spinal alignment on the development of proximal junctional kyphosis after instrumented posterior spinal fusions for idiopathic scoliosis

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Abstract

Purpose: To assess if the preservation of preoperative kyphosis within the cephalad two motion segments of instrumented posterior spinal fusions (PSF), for idiopathic scoliosis (IS), would be associated with lower frequency of proximal junctional kyphosis (PJK) at 2 years postoperatively. Previous studies on PJK in IS have reported conflicting findings; none has evaluated the relationship between segmental kyphosis within the cephalad instrumented construct and PJK.

Methods: One hundred consecutive patients undergoing PSF for IS by a single surgeon with minimum 2-year follow-up were evaluated. Radiographic evaluation focused on sagittal alignment of the upper instrumented vertebrae (UIV), the 1 and 2 vertebrae cephalad (UIV + 1, UIV + 2) and caudal (UIV - 1, UIV - 2). This was measured between the inferior endplate of the UIV and the superior endplate of the UIV + 1 and UIV + 2 or between the superior endplate of the UIV and the inferior endplate of the UIV - 1 and UIV - 2. PJK was defined as present if the final UIV + 2 $\geq 10^\circ$ and final UIV + 2-preop UIV + 2 $\geq 10^\circ$.

Results: There were 78 females and 22 males whose mean age was 14.6 (± 2.1) years at surgery; mean follow-up was 3.9 (2-9.3) years. The overall frequency of PJK was 25% (25/100) at final follow-up. Preoperative mean coronal curve measured 63° (40°-107°) with a mean 66% correction at final follow-up. UIV was T2 (n = 15), T3 (n = 47) or T4 (n = 38). More caudal

UIVs were associated with PJK development (p = 0.04): T2 (13%), T3 (21%) and T4 (34%). Greater preoperative T5-T12 thoracic kyphosis and UIV - 2, and lower major curve apex (below T12) were more likely to develop PJK (p = 0.019, p = 0.004 and p = 0.007, respectively). Post-operatively, larger values for UIV - 1 (p \leq 0.001) and UIV - 2 (p = 0.002) were associated with PJK at final follow-up. Longer fusion lengths (10-13 vs. 6-9 segments, p = 0.02) and the presence of thoracolumbar/lumbar structural curves (Lenke 3-6 vs. 1-2, p = 0.032) had higher rates of PJK (32% vs 10% and 37% vs 18%, respectively). Changes in UIV - 1 and UIV - 2 (preoperatively to immediately post-op) did not influence the development of PJK. At final follow-up, no patient required revision surgery for symptomatic proximal junctional kyphosis.

Conclusions: In this study, changes in UIV - 1 and UIV - 2 at surgery were not related to PJK. Greater preoperative T5-T12 thoracic kyphosis and UIV - 2, lower major curve apex (T12 and below), and greater post-operative UIV - 1 and UIV - 2 were associated with higher frequencies of PJK. Higher UIV (T2 vs. T4) and LIV levels had a protective effect against PJK. Based on this study, the preservation of segmental kyphosis within the instrumented cephalad two levels of the PSF did not minimize the occurrence of radiographic PJK.

Level of evidence: Level IV.

Medical and cardio-vascular emergency department visits during the COVID-19 pandemic in 2020: is there a collateral damage? A retrospective routine data analysis

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Abstract

Background: In this retrospective routine data analysis, we investigate the number of emergency department (ED) consultations during the COVID-19 pandemic of 2020 in Germany compared to the previous year with a special focus on numbers of myocardial infarction and acute heart failure.

Methods: Aggregated case numbers for the two consecutive years 2019 and 2020 were obtained from 24 university hospitals and 9 non-university hospitals in Germany and assessed by age, gender, triage scores, disposition, care level and by ICD-10 codes including the tracer diagnoses myocardial infarction (I21) and heart failure (I50).

Results: A total of 2,216,627 ED consultations were analyzed, of which 1,178,470 occurred in 2019 and 1,038,157 in 2020. The median deviation in case numbers between 2019 and 2020 was - 14% [CI (- 11)-(- 16)]. After a marked drop in all cases in the first COVID-19 wave in spring 2020, case numbers normalized during the summer. Thereafter starting in

calendar week 39 case numbers constantly declined until the end of the year 2020. The decline in case numbers predominantly concerned younger [- 16%; CI (- 13)-(- 19)], less urgent [- 18%; CI (- 12)-(- 22)] and non-admitted cases [- 17%; CI (- 13)-(- 20)] in particular during the second wave. During the entire observation period admissions for chest pain [- 13%; CI (- 21)-2], myocardial infarction [- 2%; CI (- 9)-11] and heart failure [- 2%; CI (- 10)-6] were less affected and remained comparable to the previous year.

Conclusions: ED visits were noticeably reduced during both SARS-CoV-2 pandemic waves in Germany but cardiovascular diagnoses were less affected and no refractory increase was noted. However, long-term effects cannot be ruled out and need to be analysed in future studies.

Keywords: COVID-19; Cardiovascular diagnoses; Collateral damage; Emergency department; Pandemic.

Medial Elbow Pain Syndrome: Current Treatment Strategies

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Abstract

Medial elbow pain is a common presentation that can be a challenge to appropriately treat for the orthopedic surgeon. Causes include medial epicondylitis, ulnar neuritis, ulnar collateral ligament injury, flexor pronator strain, or snapping medial triceps. A good outcome is typically achieved with adequate treatment of tendon degeneration at the common flexor tendon origin. Mainstay treatment is nonoperative modalities such as stretching, rest, activity modification,

therapy, and injections. If nonoperative management fails, intermediate interventions such as extracorporeal shockwave therapy, platelet-rich plasma injections, prolotherapy, and ultrasound-guided percutaneous tenotomy can be attempted. Surgical treatments are dictated based on the severity of the pathology, involvement of soft tissues, and concomitant pathology. Medial elbow complaints can be multifactorial and require a broad differential diagnosis.

Joint aspiration and serum markers - do they matter in the diagnosis of native shoulder sepsis? A systematic review

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Abstract

Background: Septic arthritis of the native shoulder is traditionally diagnosed with the same strategies as knee or hip septic arthritis. However, septic arthritis of the shoulder is frequently a missed or delayed diagnosis. Reliance on aspiration and serum markers has been called into question recently. The purpose of this study was to conduct a systematic review investigating the value of joint aspiration and serum markers in the diagnosis of native shoulder joint sepsis.

Methods: PubMed/MEDLINE, Scopus, and the Cochrane Library were used in the systematic literature search from January 1, 1960, through January 23, 2021. The primary outcome was to report on the synovial white cell count of patients with native shoulder sepsis. Descriptive statistics using percentages, means, and intraclass correlation coefficient (ICC) values were used to summarize the results.

Results: Thirty-one studies, including 25 case series, one case-control, and five cohort studies with a total of 7434 native shoulder joints, were included. There was no standardized approach to diagnosing septic arthritis of the shoulder. Only 10 studies (32%) reported on synovial white cell count with the majority yielding aspiration counts greater than 50,000 cells/mm³, although one study was as low as 30,000 cells/mm³.

Conclusions: The diagnosis of native shoulder joint sepsis lacks uniformity. Methods used to evaluate shoulder sepsis are heterogeneous and may lead to delays or misdiagnosis with devastating sequelae. Synovial white cell count is underutilized and may also present with a lower value than expected, which is likely related to the time interval between symptom onset and diagnosis.

Technical considerations and early results of magnetic compressive intramedullary nailing for humeral shaft delayed unions and nonunions

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Abstract

Background: Expandable magnetic rods and intramedullary nails are being used in a number of innovative ways, including limb length discrepancy and scoliosis correction. However, recently, the full complement of these devices has been further explored, with the utilization of their compressive capacity to improve fracture healing. The purpose of the present study was to report on early results of compressive magnetic intramedullary nailing for humeral shaft delayed unions and nonunions.

Methods: This retrospective case series was completed at a level 1 trauma center, with adult patients who underwent compressive intramedullary nailing from 2017 to 2021 for humeral shaft nonunion or delayed union. The primary indication for this procedure was nonunion in the setting of previous conventional fixation, but a subset of patients with atrophic nonunions and risk factors for recalcitrant nonunion were also included.

Results: Fourteen patients, with a mean age of 51 ± 17 years,

underwent compressive magnetic intramedullary nailing. Nine patients had previously undergone surgery, 6 of which had undergone multiple prior procedures. Five others were initially treated nonoperatively and underwent surgery 4.1 ± 2.9 months out from injury. Ten patients went on to union at a mean of 2.9 ± 2.4 months. One patient experienced hardware failure with nail cut-out at 2 weeks, and one required revision surgery for a wound infection. Three other patients were lost to follow-up, one of which was deceased for reasons unrelated to surgery.

Conclusion: Compressive magnetic intramedullary nails are a viable solution for complex humeral shaft nonunions, particularly in the setting of previously well-fixed fractures and those at risk of recalcitrant nonunion. However, comparative and prospective studies looking at union rates and secondary procedures are needed to more clearly define their role in treatment and assure their safety, given recent concerns regarding osteolysis at the nail modular junction.

Unique indications for internal joint stabilizer for elbow instability

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Abstract

Background: Treatment of elbow instability remains challenging despite advancements in surgical techniques. The objective of this study was to evaluate obesity, advanced age or frailty, and altered cognitive function (because of mental handicap, stroke, dementia, or traumatic brain injury) as unique indications for the use of the internal joint stabilizer (IJS) to augment surgical treatment of elbow instability.

Methods: This was a retrospective review of all patients 18 years and older with elbow instability who were managed with an IJS along with standard measures of care for their specific injury, such as fracture fixation and collateral ligament reconstruction. Patients were excluded if they did not have a minimum follow-up of 3 months. All patients were treated by a single shoulder and elbow fellowship-trained orthopedic traumatologist at an urban university-based level 1 trauma center.

Results: Twenty-two patients were included in the study. Five patients were 60 years of age or older. Nine patients had a body mass index of 30 or greater. Five patients had a history of 1 or more cerebral insults or cognitive impairment. The majority of patients (21/22; 95%) regained elbow stability

after the index surgery. At last follow-up, 14 of 22 patients (63%) regained a functional arc of motion, defined as at least 100° arc of motion, and 77% of patients had at least 90° of motion. Complications requiring revision surgery included culture-negative recurrent elbow instability (n = 1), deep infection (n = 1), and IJS failure without recurrent instability (n = 1). The IJS was removed in all 3 cases. Twelve patients underwent delayed IJS removal >2 months after the index surgery to grant additional time for bony and ligamentous healing and to permit secondary contracture release at the time of IJS removal. No complications were seen from delayed IJS removal.

Conclusion: The IJS may be used to create elbow stability in complex patients, regardless of weight, frailty, cognitive function, neurologic insult, or other comorbidities. Unlike external fixation, the IJS does not require pin site care and is relatively light and low-profile. When augmenting surgical fixation for elbow instability, the IJS may be preferable for patients with complex comorbidities or social dynamics.

Unexpected high early failure rate of the Nexel total elbow arthroplasty

Mark E Morrey¹, Chad Songy¹, Jacob J Triplet¹, Adnan N Cheema¹, Shawn W O'Driscoll¹, Joaquin Sanchez-Sotelo¹, Bernard F Morrey¹

Abstract

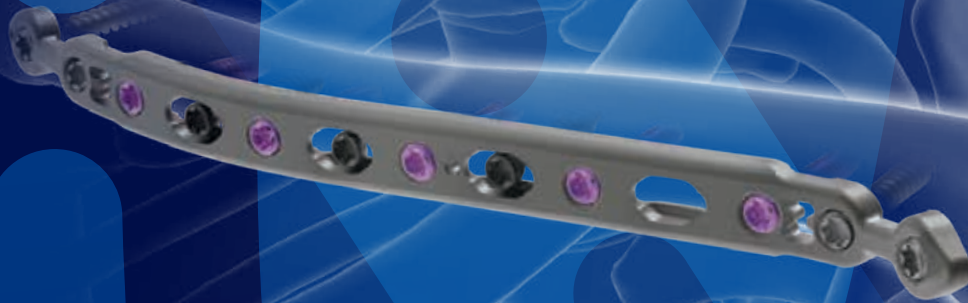
Background: Aseptic loosening, polyethylene wear, and mechanical failure have limited the use of total elbow arthroplasty (TEA) in physically demanding patients. Newer implant designs have been introduced to improve mechanical performance. The purpose of this study was to report the results obtained after implantation of the Nexel TEA.

Methods: Over a 3-year period, 2 surgeons implanted a total of 35 consecutive Nexel primary TEAs. The average patient age was 65 years, and standard TEA indications were utilized. Elbows were evaluated for pain, motion, the Mayo Elbow Performance Score, complications, and reoperations.

Results: Twelve elbows underwent a revision surgery with removal of either a part of or all Nexel components at an average of 2.2 years. All revision surgeries performed at our institution revealed gross loosening of the component(s). Metallic debris and periprosthetic fractures were present in 45%

and 50% of cases, respectively. Radiographic evaluation of existing components revealed humeral component loosening and periprosthetic fractures in 2 and 4 elbows, respectively. Overall, 17 of 35 (50%) elbows underwent reoperation, and 20 of 35 (60%) elbows sustained at least 1 postoperative complication.

Conclusion: Primary TEA with implantation of this implant was associated with an unacceptably high rate of early implant loosening, periprosthetic fracture, and reoperation. We hypothesize that this early unexpected mechanical failure could be explained by both the utilization of a titanium-on-polyethylene bearing surface and a more posterior center of rotation causing premature anterior impingement with flexion leading to failure of the bonding interface, secondary titanium particle shedding, polyethylene wear, and osteolysis.



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Predictors of reoperation after internal fixation of intra-articular distal humerus fractures

Jeremy S Somerson ¹, Mark E Morrey ², Joaquin Sanchez-Sotelo ², Bernard F Morrey ²

Abstract

Background: Despite good reported outcomes with open reduction and internal fixation of intra-articular distal humerus fractures, complication rates remain high. The objective of this work is to identify factors associated with reoperation.

Methods: Sixty-three patients treated with open reduction and internal fixation for intra-articular (Arbeitsgemeinschaft für Osteosynthesefragen type C) distal humerus fractures between 2004 and 2010 were identified using an institutional trauma registry, 62 of which were followed for a minimum of six months. Age, gender, fracture subclassification, open fracture presence, Injury Severity Score, time to definitive surgery, length of postoperative immobilization, and type of approach were recorded. Multivariate analysis was utilized to identify factors independently associated with reoperation.

Results: Complications requiring reoperation developed in

25 (40.3%) elbows. The most common reasons were wound dehiscence or infection in nine elbows (14.5%) and symptomatic hardware in six (9.6%). During multivariate analysis, only olecranon osteotomy remained an independent predictor for reoperation ($P = 0.043$).

Discussion: Despite improved internal fixation techniques, a high proportion of elbows require reoperation after open reduction and internal fixation for distal humerus fractures. Higher complication rates in fractures fixed through an olecranon osteotomy may reflect additional reoperations due to nonunion of the osteotomy or need to remove hardware from the ulna.

Level of evidence: Prognostic Level III.

Ultrasonic Percutaneous Tenotomy for Recalcitrant Lateral Elbow Tendinopathy: Clinical and Sonographic Results at 90 Months

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Abstract

Background: In a study from our institution, ultrasonic percutaneous tenotomy of the brevis and the common extensor tendon for recalcitrant lateral elbow tendinopathy showed excellent safety profiles, high tolerability, efficiency, sustained pain relief, functional improvement, and sonographic evidence of tissue healing in 20 patients at 3 years' follow-up.

Purpose: To explore the long-term clinical and sonographic results of ultrasonic percutaneous tenotomy of the brevis and the common extensor tendon.

Study design: Case series; Level of evidence, 4.

Methods: The same cohort of 20 patients was recalled after 7 years, and visual analog scale (VAS) for pain and Disabilities of the Arm, Shoulder and Hand (DASH) scores, need for secondary intervention, and overall satisfaction were assessed. They were also reassessed using ultrasound imaging of the brevis and the common extensor tendon to evaluate tendon hypervascularity, tendon thickness, and the progress or the recurrence of the hypoechoic scar tissue.

Results: We successfully scored 19 patients and performed ultrasound on 16 patients with a median follow-up of 90 months (range, 86-102 months). There were no adverse outcomes and satisfaction remained at 100% (6 patients, satisfied; 13 patients, very satisfied). No patient developed a recur-

rence of symptoms and signs of lateral elbow tendinopathy, and therefore no secondary intervention was required. The improvement from baseline and early term scores was sustained ($P < .001$ for all). At 90 months, there was a significant improvement in VAS scores and DASH-Compulsory scores compared with preprocedure scores and all follow-up times until 3 months. There was no difference in VAS scores and DASH-Compulsory scores at 90 months compared with 6 and 36 months. For DASH-Work scores, there was a significant improvement at 90 months compared with preprocedure scores, but there was no difference between DASH-Work scores at 90 months and scores at all other points of follow-up. At 90 months, hypervascularity remained resolved in 79% of patients, while all patients had reduced tendon swelling and sustained resolution or reduction of the hypoechoic lesion.

Conclusion: At the long-term follow-up of 90 months, ultrasonic percutaneous tenotomy of the brevis and the common extensor tendon, previously shown to enhance recovery of lateral elbow tendinopathy, demonstrated good durability of pain relief and functional recovery that was previously achieved. This was accompanied by sustained sonographic tissue healing with no significant deterioration.

The 8-item Modified Frailty Index Is an Effective Risk Assessment Tool in Anterior Cervical Decompression and Fusion

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Abstract

Study design: Case-control study; Level of evidence, 3.

Objective: Anterior cervical discectomy and fusion (ACDF) is one of the most common procedures for cervical diseases often with reliable outcomes. However, morbidity rates can be as high as 19.3% so appropriate patient selection and risk stratification is imperative. Our modified frailty index (MFI) predicts postoperative complications after other orthopaedic procedures. We hypothesized that this index would predict complications in a large cohort of ACDF patients.

Methods: We reviewed the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database, including patients who underwent ACDF from 2015-2020. An 8-item MFI score was calculated for each patient. We recorded 30-days postoperative complications, readmission, and reoperation rates, adjusting for baseline features using standard multivariate regression. This project was approved of by the University of Texas Health Science Center Institutional Review Board and an IRB exception was granted.

Results: We identified 17 662 ACDF cases. Patients with MFI of 5 or greater had a 37.53 times increased odds of incurring postoperative complications compared to patients with MFI of 0 ($P < .001$) even when age, sex, race, and ethnicity were controlled for. Specifically, life-threatening Clavien-Dindo IV complications, as well as wound, cardiac, renal, and pulmonary complications were significantly increased in patients with an MFI of 5 or greater. Also, as MFI increased from 1-2 to 3-4 to 5 or greater, the odds of readmission increased from 1.36 to 2.31 to 5.42 times ($P < .001$) and odds of reoperation from 1.19 ($P = .185$) to 2.3 to 6.54 times ($P < .001$). Frailty was still associated with increased complications, readmission, and reoperation after controlling for demographic data, including age, as well as operative time and length of stay.

Conclusion: Frailty is highly predictive of postoperative complications, readmission, and reoperation following ACDF. Employing a simple frailty evaluation can guide surgical decision-making and patient counseling for cervical disease.

The T4-L1-Hip Axis: Defining a Normal Sagittal Spinal Alignment

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Abstract

Study design: This is a cross-sectional cohort.

Objective: The aim was to describe sagittal plane alignment and balance in a multinational cohort of nondegenerated, asymptomatic adults.

Summary of background data: Current sagittal alignment targets were developed using correlations between radiographic and quality-of-life measures in spinal deformity patients, rather than disease-free samples leading to relatively poor accounting for variance within a population.

Materials and methods: Sagittal balance was defined using vertebral body tilt and spinopelvic alignment was defined as the vertebral pelvic angles from C2 to L5 (vertebral pelvic angle=vertebral tilt+pelvic tilt). Associations with pelvic incidence (PI) were assessed using linear regression. Multivariable linear regression was used to estimate a normal L1-S1 lordosis, adjusting for PI and the L1 pelvic angle (L1PA). Correlation between the L1 and T4 pelvic angles was assessed to define a normal thoracic alignment conditioned on lumbar

alignment.

Results: Among 320 volunteers from 4 continents, median age was 37% and 60% were female. C2 tilt was independent of PI with minimal variation. PI was inadequate for estimating a normal lumbar lordosis (L1-S1, $r^2 = 0.3$), but was strongly associated with the lumbar pelvic angles (L1PA, $r^2 = 0.58$). Defining lumbar lordosis as a function of PI and L1PA resulted in high explained variance ($R^2 = 0.74$) and the T4 pelvic angle had near perfect correlation with the L1PA ($r = 0.9$).

Conclusions: We defined normal sagittal balance and spinopelvic alignment in a disease-free international volunteer cohort. Four parameters are either fixed or directly modifiable in surgery and can define a normal thoracic and lumbar alignment: the L1-S1 lordosis defined as a function of PI and the L1PA; and the T4 pelvic angle is nearly equivalent to the L1PA, aligning the T4-L1-hip axis.

Neurologic injury after spinopelvic dissociation: Incidence, outcome, and predictors

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Abstract

Background: Traumatic spinopelvic dissociation is a rare injury pattern resulting in discontinuity between the spine and bony pelvis. This injury is associated with a known risk of neurologic compromise which can impact the clinical outcome of these patients. We sought to determine incidence and characteristics of neurologic injury, outcomes following treatment, and predictive factors for neurologic recovery.

Methods: We reviewed the clinical documentation and imaging of 270 patients with spinopelvic dissociation from three Level-1 trauma centers treated over a 20-year period. From this cohort, 137 patients fulfilled inclusion criteria with appropriate follow-up. Details surrounding patient presentation, incidence of neurologic injury, and outcome variables were collected for each injury. Neurologic injuries were categorized using the Gibbons criteria. Multivariate analysis was performed to assess for patient and injury factors predictive of neurologic injury and recovery.

Results: The overall incidence of neurologic injury in spinopelvic dissociation injuries was 33% (45/137), with

bowel and/or bladder dysfunction (n=16) being the most common presentation. Complete neurologic recovery was seen in 26 cases (58%) and two patients (4%) improved at least one Gibbon stage in clinical follow-up. The most common long-term neurologic sequela at final follow-up was radiculopathy (n=12, 9%). Increased kyphosis was found to be associated with neurologic injury (p=0.002), while location of transverse limb and Roy-Camille type were not predictive of neurologic injury (p=0.31 and p=0.07, respectively). There were no factors found to be predictive of neurologic recovery in this cohort.

Conclusion: Neurologic injury is commonly seen in patients with spinopelvic dissociation and complete neurologic recovery was seen in the majority of patients at final follow-up. When present, long term neurologic dysfunction is most commonly characterized by radiculopathy. While increasing kyphosis was shown to be associated with neurologic injury, no patient or injury factors were predictive of neurologic recovery.

Proximal junctional failure in primary thoracolumbar fusion/fixation to the sacrum/pelvis for adult symptomatic lumbar scoliosis: long-term follow-up of a prospective multicenter cohort of 160 patients

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⁷Orthopedic Surgery, Duke University, Durham, North Carolina.

Abstract

Objective: Proximal junctional failure (PJF) is a severe form of proximal junctional kyphosis. Previous reports on PJF have been limited by heterogeneous cohorts and relatively short follow-ups. The authors' objectives herein were to identify risk factors for PJF and to assess its long-term incidence and revision rates in a homogeneous cohort.

Methods: The authors reviewed data from the Adult Symptomatic Lumbar Scoliosis 1 trial (ASLS-1), a National Institutes of Health-sponsored prospective multicenter study. Inclusion criteria were an age ≥ 40 years, ASLS (Cobb angle $\geq 30^\circ$ and Oswestry Disability Index [ODI] ≥ 20 or Scoliosis Research Society revised 22-item questionnaire [SRS-22r] score ≤ 4.0 in pain, function, or self-image domains), and primary thoracolumbar fusion/fixation to the sacrum/pelvis of ≥ 7 levels. PJF was defined as a postoperative proximal junctional angle (PJA) change $> 20^\circ$, fracture of the uppermost instrumented vertebra (UIV) or UIV+1 with $> 20\%$ vertebral height loss, spondylolisthesis of UIV/UIV+1 > 3 mm, or UIV screw dislodgment.

Results: One hundred sixty patients (141 women) were included in this analysis and had a median age of 62 years and a mean follow-up of 4.3 years (range 0.1-6.1 years). Forty-six patients (28.8%) had PJF at a median of 0.92 years (IQR 0.14, 1.23 years) following surgery. Based on Kaplan-Meier analyses, PJF rates at 1, 2, 3, and 4 years were 14.4%, 21.9%, 25.9%, and 27.4%, respectively. On univariate analysis, PJF

was associated with greater age ($p = 0.0316$), greater body mass index (BMI; $p = 0.0319$), worse baseline patient-reported outcome measures (PROMs; ODI, SRS-22r, and SF-12 Physical Component Summary [PCS]; all $p < 0.04$), the use of posterior column osteotomies (PCOs; $p = 0.0039$), and greater postoperative thoracic kyphosis (TK; $p = 0.0031$) and PJA ($p < 0.001$). The use of UIV hooks was protective against PJF ($p = 0.0340$). On regression analysis (without postoperative measures), PJF was associated with greater BMI (HR 1.077, 95% CI 1.007-1.153, $p = 0.0317$), lower preoperative PJA (HR 0.607, 95% CI 0.407-0.906, $p = 0.0146$), and greater preoperative TK (HR 1.362, 95% CI 1.082-1.715, $p = 0.0085$). Patients with PJF had worse PROMs at the last follow-up (ODI, SRS-22r subscore and self-image, and SF-12 PCS; $p < 0.04$). Sixteen PJF patients (34.8%) underwent revision, and PJF recurred in 3 (18.8%).

Conclusions: Among 160 primary ASLS patients with a median age of 62 years and predominant coronal deformity, the PJF rate was 28.8% at a mean 4.3-year follow-up, with a revision rate of 34.8%. On univariate analysis, PJF was associated with a greater age and BMI, worse baseline PROMs, the use of PCOs, and greater postoperative TK and PJA. The use of UIV hooks was protective against PJF. On multivariate analysis (without postoperative measures), a higher risk of PJF was associated with greater BMI and preoperative TK and lower preoperative PJA.

The impact of lumbar alignment targets on mechanical complications after adult lumbar scoliosis surgery

Brian L Dial¹, Jeffrey M Hills¹, Justin S Smith², Juan Pablo Sardi², Bruno Lazaro², Christopher I Shaffrey³, Shay Bess⁴, Frank J Schwab⁵, Virginie Lafage⁵, Renaud Lafage⁵, Michael P Kelly⁶, Keith H Bridwell¹

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Abstract

Purpose: The purpose of this study was to determine the discriminatory ability of age-adjusted alignment offset and the global alignment and proportion (GAP) score parameters to predict postoperative mechanical complications.

Methods: Surgical patients from the Adult Symptomatic Lumbar Scoliosis cohort were reviewed at 2 year follow up. Age-adjusted alignment offsets and GAP parameters were calculated for each patient. A series of nonlinear logistic regression models were fit, and the odds of mechanical complications were calculated. The discriminatory ability of the GAP score, GAP score parameters, and age-adjusted alignment offsets were determined plotting receiver operative characteristic (ROC) with the C statistic (AUC).

Results: A total of 165 patients were included. A total of 49 mechanical complications occurred in 41 patients (21 prox-

imal junctional kyphosis and 28 pseudoarthrosis). The GAP score had no discriminatory ability in this cohort. Relative lumbar lordosis 15 degrees greater than ideal lumbar lordosis was associated with greater mechanical complications. A lumbar distribution index of 90% was associated with fewer mechanical complications compared to a lumbar distribution index of 65%. Age-adjusted offset alignment targets had no discriminatory ability to predict mechanical complications.

Conclusion: Radiographic alignment targets using either age-adjusted alignment target offset or GAP score parameters had minimal ability to predict mechanical complications in isolation. Mechanical complications following adult spinal deformity surgery are complex, and patient factors play a critical role. Clinical trial registration This study was registered at ClinicalTrials.gov (number NCT00854828) in March 2009.

A Patient-specific Approach to Alignment and Proximal Junctional Kyphosis Risk Assessment in Adult Spinal Deformity Surgery: Development and Validation of a Predictive Tool

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Abstract

Study design: This was a single-institution, retrospective cohort study.

Objective: We aimed to develop a predictive model for proximal junctional kyphosis (PJK) severity that considers multiple preoperative variables and modifiable surgical alignment.

Summary of background data: PJK is a common complication following adult deformity surgery. Current alignment targets account for age and pelvic incidence but not other risk factors.

Materials and methods: This is a single-institution, retrospective cohort study of adult deformity patients with a minimum 2-year follow-up undergoing instrumented fusion between 2009 and 2018. A proportional odds regression model was fit to estimate PJK probability and Hart-International Spine Study Group (ISSG) PJK severity score. Predictors included preoperative Charlson Comorbidity Index, vertebral Hounsfield Units near the upper instrumented vertebrae, pelvic incidence, T1-pelvic angle, and postoperative L1-L4 and L4-S1 lordosis. Predictor effects were assessed using adjusted odds ratios and a nomogram constructed for estimating PJK probability. Bootstrap resampling was used for internal

validation.

Results: Of 145 patients, 47 (32%) developed PJK. The median PJK severity score was 6 (interquartile range, 4-7.5). After adjusting for predictors, Charlson Comorbidity Index, Hounsfield Units, preoperative T1-pelvic angle, and postoperative L1-L4 and L4-S1 lordosis were significantly associated with PJK severity ($P < 0.05$). After adjusting for potential overfitting, the model showed acceptable discrimination [C-statistic (area under the curve)=0.75] and accuracy (Brier score=0.10).

Conclusions: We developed a model to predict PJK probability, adjusted for preoperative alignment, comorbidity burden, vertebral bone density, and modifiable postoperative L1-L4 and L4-S1 lordosis. This approach may help surgeons assess the patient-specific risk of developing PJK and provide a framework for future predictive models assessing PJK risk after adult deformity surgery.

Level of evidence: Level III.

The impact of lumbar alignment targets on mechanical complications after adult lumbar scoliosis surgery

Brian L Dial¹, Jeffrey M Hills¹, Justin S Smith², Juan Pablo Sardi², Bruno Lazaro², Christopher I Shaffrey³, Shay Bess⁴, Frank J Schwab⁵, Virginie Lafage⁵, Renaud Lafage⁵, Michael P Kelly⁶, Keith H Bridwell¹

Abstract

Purpose: The purpose of this study was to determine the discriminatory ability of age-adjusted alignment offset and the global alignment and proportion (GAP) score parameters to predict postoperative mechanical complications.

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Results: A total of 165 patients were included. A total of 49 mechanical complications occurred in 41 patients (21 prox-

imal junctional kyphosis and 28 pseudoarthrosis). The GAP score had no discriminatory ability in this cohort. Relative lumbar lordosis 15 degrees greater than ideal lumbar lordosis was associated with greater mechanical complications. A lumbar distribution index of 90% was associated with fewer mechanical complications compared to a lumbar distribution index of 65%. Age-adjusted offset alignment targets had no discriminatory ability to predict mechanical complications.

Conclusion: Radiographic alignment targets using either age-adjusted alignment target offset or GAP score parameters had minimal ability to predict mechanical complications in isolation. Mechanical complications following adult spinal deformity surgery are complex, and patient factors play a critical role. Clinical trial registration This study was registered at ClinicalTrials.gov (number NCT00854828) in March 2009.

Survival rates in atlanto-occipital dissociation: a look at the past 20 years

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Abstract

Background context: Atlanto-occipital dissociation (AOD) has historically been considered a fatal injury. Recent small case series, however, have suggested that AOD injuries have become increasingly survivable. There has not been an adequately powered study that confirms this.

Purpose: The aim of this study is to assess whether the survival rate for patients with AOD increased over time.

Study design/setting: Retrospective case series.

Patient sample: Patients with traumatic AOD identified from our Level 1 Trauma Center database.

Outcome measures: Mortality following traumatic AOD.

Methods: Patients with traumatic AOD from 1996 to 2019 were retrospectively identified from our Level 1 Trauma Center database using International Classification of Diseases 9 and 10 codes. Patients were stratified into two cohorts- those diagnosed before August 1, 2015 and after.

Results: A total of 52 patients met our inclusion criteria and were analyzed. Mean age was 34.41 (11.71), with 34 (65.4) females, and 26 (50) Hispanics. Mean BMI was 28.13 (7.30), mean injury severity score was 40.79 (21.72), and mean Glasgow coma scale was 5.91 (4.72). Overall, 33 patients died (63.5%). The mortality rate before 2015 was 81.80%, this number dropped down to 50% for those who were treated post 2015 ($p=.01$).

Conclusions: This study demonstrates that patients treated recently for AOD at a level 1 trauma center were more likely to survive than patients treated in the past at the same center. Possible reasons for the improved survival rate seen in this study include: increased awareness of AOD, improved diagnostic protocols with more uniform computed tomography based imaging, and advances in the care of these patients.

Endoscopic Gluteus Medius Repair Replicates Open, Knotless Repair With Similar Cyclic Loading Properties: A Cadaveric Study

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Abstract

Purpose: To compare the repair strength, gap formation, and mode of failure between endoscopic and open double-row gluteus medius repairs in a cadaveric model.

Methods: Six pairs of fresh-frozen human cadavers were used in this study. Gluteus medius tears were created in an open fashion and then repaired with either open or endoscopic techniques. Specimens were manually preloaded to 5 N, then cycled between 20-50 N for 150 cycles s. Then, a ramp to/s. Specimens were then returned to 10 N and ramped to failure at 1 mm/s. Gap formation and strengths of the construct were compared for the 2 techniques.

Results: Biomechanical testing resulted in no significant differences in ultimate load ($P = .86$) or gap formation ($P > .10$) between groups. Ninety-two percent of specimens failed near

the muscle origin on the ilium.

Conclusions: This study shows that both open and endoscopic gluteus medius repairs are stronger than the muscle-bone interface in a cadaveric model and loaded biomechanically in tension between the ilium origin and femoral insertion. Further, endoscopic technique is able to replicate open, knotless gluteus medius repair technique in terms of gap formation in physiologic (i.e., subfailure) cyclic loading.

Clinical relevance: Gluteus medius tendinopathy is an increasingly common recognized etiology of lateral hip pain. When tears occur, debate exists over whether open or endoscopic repair procedures are optimal. Double-row endoscopic gluteus medius repair with knotless suture anchors may be an alternative to open repair.

Flynn ME, Beason DP, Bartush KC, Ryan MK, Emblom BA. Endoscopic Gluteus Medius Repair Replicates Open, Knotless Repair With Similar Cyclic Loading Properties: A Cadaveric Study. *Arthrosc Sports Med Rehabil.* 2022 Jan 21;4(2):e617-e622.

Heath DM, Koslosky EJ, Bartush KC, Hogue GD. Marijuana in Orthopaedics: Effects on Bone Health, Wound-Healing, Surgical Complications, and Pain Management. *JBJS Rev.* 2022 Feb 21;10(2).

Marijuana in Orthopaedics: Effects on Bone Health, Wound-Healing, Surgical Complications, and Pain Management

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²Department of Orthopaedics, Boston Children's Hospital/Harvard Medical School, Boston, Massachusetts.

Abstract

Marijuana use is on the rise in the United States, and there is a paucity of information on the effects of cannabis and its chemical constituents on bone health, wound-healing, surgical complications, and pain management.

Current evidence suggests that cannabidiol (CBD) may enhance bone health and metabolism, while $\Delta 9$ -tetrahydrocan-

nabinol ($\Delta 9$ -THC), the major psychoactive component in marijuana, has an inhibitory effect.

Marijuana users are at higher risk for delayed bone-healing, demonstrate lower bone mineral density, are at increased risk for fracture, and may experience postoperative complications such as increased opioid use and hyperemesis.

Intact PCL is a potential predictor of ACL graft size in the skeletally immature knee and other anatomic considerations for ACL reconstruction

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Abstract

Purpose: To develop a method for using an intact posterior cruciate ligament (PCL) as a predictor of anterior cruciate ligament (ACL) graft size and examine possible differences in tunnel length based on all-epiphyseal drilling method.

Methods: One hundred one patients 5-18 years of age with magnetic resonance imaging (MRI) of the knee at an outpatient pediatric orthopaedic clinic from 2008 to 2020 were included. ACL and PCL coronal, sagittal, and length measurements were made in all patients. Tunnel length measurements were made in patients with open physes. Statistical analyses were performed to evaluate potential associations in patient bony or ligamentous measurements.

Results: PCL sagittal width and PCL coronal width were statistically significant predictors of ACL sagittal width and ACL coronal width, respectively ($p = 0.002$, $R = 0.304$; $p = 0.008$,

$R = 0.264$). The following equations were developed to calculate ACL coronal and sagittal width measurements from the corresponding measurement on an intact PCL; ACL Coronal Width (mm) = $6.23 + (0.16 \times \text{PCL Coronal Width})$; ACL Sagittal Width (mm) = $5.85 + (0.53 \times \text{PCL Sagittal Width})$. Mean tibial maximum oblique length (27.8 mm) was longer than mean tibial physseal sparing length (24.9 mm). Mean femoral maximum oblique length (36.9 mm) was comparable to mean femoral physseal sparing length (36.1 mm). Both were longer than mean femoral straight lateral length (32.7 mm).

Conclusion: An intact PCL is a predictor of native ACL size. Tunnel length differs based on chosen drilling method in all-epiphyseal technique.

Level of evidence: Diagnostic Level III.

Current Reviews in Musculoskeletal Medicine: Current Controversies for Treatment of Meniscus Root Tears

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Abstract

Purpose of review: The role of the meniscus in preserving the biomechanical function of the knee joint has been clearly defined. The hypothesis that meniscus root integrity is a prerequisite for meniscus function is supported by the development of progressive knee osteoarthritis (OA) following meniscus root tears (MRTs) treated either non-operatively or with meniscectomy. Consequently, there has been a resurgence of interest in the diagnosis and treatment of MRTs. This review examines the contemporary literature surrounding the natural history, clinical presentation, evaluation, preferred surgical repair technique and outcomes.

Recent findings: Surgeons must have a high index of suspicion in order to diagnose a MRT because of the nonspecific clinical presentation and difficult visualization on imaging. Compared with medial MRTs that commonly occur in middle age/older patients, lateral meniscus root injuries tend to occur

in younger males with lower BMIs, less cartilage degeneration, and with concomitant ligament injury. Subchondral insufficiency fractures of the knee have been found to be associated with both MRTs and following arthroscopic procedures. Meniscus root repair has demonstrated good outcomes, and acute injuries with intact cartilage should be repaired. Cartilage degeneration, BMI, and malalignment are important considerations when choosing surgical candidates. Meniscus centralization has emerged as a viable adjunct strategy aimed at correcting meniscus extrusion. Meniscus root repair results in a decreased rate of OA and arthroplasty and is economically advantageous when compared with nonoperative treatment and partial meniscectomy. The transtibial pull-through technique with the addition of centralization for the medial meniscus is associated with encouraging early results.

Inconsistent Reporting of Preauthorization Medical Criteria for Osteochondral Allograft Transplantation Surgery

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Abstract

Background: Although osteochondral allograft (OCA) transplantation has been a standard treatment for patients with osteochondral lesions, there is a disagreement in commercial payers' medical criteria regarding the definition of medical suitability and thus authorization for OCA transplantation. The primary goal of this study was to understand where consensus between a committee of experienced cartilage restoration surgeon scientists and payer policies existed and where there was significant disagreement.

Methods: U.S. private payers were identified by reviewing health insurance market research literature. Medical criteria were then obtained from publicly available payer medical policies. A literature review was conducted to identify supporting evidence for consensus statements based on private payer medical criteria. The MOCA (Metrics of Osteochondral Allograft) Committee, 30 experienced surgeons and subject-matter experts in OCA transplantation, used a Likert scale of 1 (strongly disagree) to 5 (strongly agree) to rank each statement. The extent of agreement and disagreement among participants was measured for each statement. Consensus was defined as agreement or disagreement of >75%.

Results: Fifty-seven statements regarding relevant medical criteria for OCA transplantation were included in the survey. All 30 MOCA Committee members completed the survey (100% response rate). Over half of the statements (52.6%) did not reach consensus. Of the remaining 27 statements that reached consensus, respondents agreed or strongly agreed with 16 statements, and disagreed or strongly disagreed with 11 statements. Inconsistent voting was observed for statements related to osteoarthritis, inflammation, and degenerative changes.

Conclusions: Commercial payers are not consistent in the medical criteria used to define patient eligibility for authorization of OCA transplantation. In contrast, an expert panel of cartilage surgeons reached a consensus that OCA transplantation was clearly suitable for a variety of specific indications. This study demonstrates the need to standardize medical criteria for cartilage restoration based on the most current literature, as well as in conjunction with experienced cartilage restoration experts.

Level of evidence: Therapeutic Level V. See Instructions for Authors for a complete description of levels of evidence.

Descriptive Characteristics and Outcomes of Patients Undergoing Revision Anterior Cruciate Ligament Reconstruction With and Without Tunnel Bone Grafting

MARS Group ¹; Steven F DeFroda ^{2,1}, Brett D Owens ^{3,1}, et al.

Abstract

Background: Lytic or malpositioned tunnels may require bone grafting during revision anterior cruciate ligament reconstruction (rACLR) surgery. Patient characteristics and effects of grafting on outcomes after rACLR are not well described.

Purpose: To describe preoperative characteristics, intraoperative findings, and 2-year outcomes for patients with rACLR undergoing bone grafting procedures compared with patients with rACLR without grafting.

Study design: Cohort study; Level of evidence, 3.

Methods: A total of 1234 patients who underwent rACLR were prospectively enrolled between 2006 and 2011. Baseline revision and 2-year characteristics, surgical technique, pathology, treatment, and patient-reported outcome instruments (International Knee Documentation Committee [IKDC], Knee injury and Osteoarthritis Outcome Score [KOOS], Western Ontario and McMaster Universities Osteoarthritis Index, and Marx Activity Rating Scale [Marx]) were collected, as well as subsequent surgery information, if applicable. The chi-square and analysis of variance tests were used to compare group characteristics.

Results: A total of 159 patients (13%) underwent tunnel grafting—64 (5%) patients underwent 1-stage and 95 (8%) underwent 2-stage grafting. Grafting was isolated to the femur in 31 (2.5%) patients, the tibia in 40 (3%) patients, and combined in 88 patients (7%). Baseline KOOS Quality of Life (QoL) and Marx activity scores were significantly lower in

the 2-stage group compared with the no bone grafting group ($P \leq .001$). Patients who required 2-stage grafting had more previous ACLRs ($P < .001$) and were less likely to have received a bone-patellar tendon-bone or a soft tissue autograft at primary ACLR procedure ($P \leq .021$) compared with the no bone grafting group. For current rACLR, patients undergoing either 1-stage or 2-stage bone grafting were more likely to receive a bone-patellar tendon-bone allograft ($P \leq .008$) and less likely to receive a soft tissue autograft ($P \leq .003$) compared with the no bone grafting group. At 2-year follow-up of 1052 (85%) patients, we found inferior outcomes in the 2-stage bone grafting group (IKDC score = 68; KOOS QoL score = 44; KOOS Sport/Recreation score = 65; and Marx activity score = 3) compared with the no bone grafting group (IKDC score = 77; KOOS QoL score = 63; KOOS Sport/Recreation score = 75; and Marx activity score = 7) ($P \leq .01$). The 1-stage bone graft group did not significantly differ compared with the no bone grafting group.

Conclusion: Tunnel bone grafting was performed in 13% of our rACLR cohort, with 8% undergoing 2-stage surgery. Patients treated with 2-stage grafting had inferior baseline and 2-year patient-reported outcomes and activity levels compared with patients not undergoing bone grafting. Patients treated with 1-stage grafting had similar baseline and 2-year patient-reported outcomes and activity levels compared with patients not undergoing bone grafting.

Returning to Activity After Anterior Cruciate Ligament Revision Surgery: An Analysis of the Multicenter Anterior Cruciate Ligament Revision Study (MARS) Cohort at 2 Years Postoperative

MARS Group ¹; John P Bigouette ¹, Erin C Owen ¹, et al.

Abstract

Background: Patients with anterior cruciate ligament (ACL) revision report lower outcome scores on validated knee questionnaires postoperatively compared to cohorts with primary ACL reconstruction. In a previously active population, it is unclear if patient-reported outcomes (PROs) are associated with a return to activity (RTA) or vary by sports participation level (higher level vs. recreational athletes).

Hypotheses: Individual RTA would be associated with improved outcomes (ie, decreased knee symptoms, pain, function) as measured using validated PROs. Recreational participants would report lower PROs compared with higher level athletes and be less likely to RTA.

Study design: Cohort study; Level of evidence, 2.

Methods: There were 862 patients who underwent a revision ACL reconstruction (rACLR) and self-reported physical activity at any level preoperatively. Those who did not RTA reported no activity 2 years after revision. Baseline data included patient characteristics, surgical history and characteristics, and PROs: International Knee Documentation Committee questionnaire, Marx Activity Rating Scale, Knee injury and Osteoarthritis Outcome Score, and the Western Ontario and McMaster Universities Osteoarthritis Index. A binary indicator was used to identify patients with same/better PROs versus worse outcomes compared with baseline, quantifying the magnitude of change in each direction, respectively. Mul-

tivariable regression models were used to evaluate risk factors for not returning to activity, the association of 2-year PROs after rACLR surgery by RTA status, and whether each PRO and RTA status differed by participation level.

Results: At 2 years postoperatively, approximately 15% did not RTA, with current smokers (adjusted odds ratio [aOR] = 3.3; $P = .001$), female patients (aOR = 2.9; $P < .001$), recreational participants (aOR = 2.0; $P = .016$), and those with a previous medial meniscal excision (aOR = 1.9; $P = .013$) having higher odds of not returning. In multivariate models, not returning to activity was significantly associated with having worse PROs at 2 years; however, no clinically meaningful differences in PROs at 2 years were seen between participation levels.

Conclusion: Recreational-level participants were twice as likely to not RTA compared with those participating at higher levels. Within a previously active cohort, no RTA was a significant predictor of lower PROs after rACLR. However, among patients who did RTA after rACLR, approximately 20% reported lower outcome scores. Most patients with rACLR who were active at baseline improved over time; however, patients who reported worse outcomes at 2 years had a clinically meaningful decline across all PROs.

Prospective 1-Year Outcomes Are Maintained at Short-Term Final Follow-Up After Superior Capsular Reconstruction Augmentation of Complete Rotator Cuff Repair

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Abstract

Purpose: To evaluate the outcomes of arthroscopic superior capsular reconstruction (SCR) augmentation of complete, massive rotator cuff repair (RCR).

Methods: A retrospective study of dermal allograft SCR-augmented RCRs performed by a single surgeon from June 2016 through December 2017 was performed with the following inclusion criteria: massive rotator cuff tear amenable to complete repair but with poor-quality native rotator cuff tissue. Radiographic follow-up was performed at 1 year, and clinical follow-up was performed at both 1 year and a minimum 2 years after surgery. Clinical follow-up included the American Shoulder and Elbow Surgeons score, visual analog scale score for pain, Subjective Shoulder Value score, active forward elevation, and external rotation. Radiographs and magnetic resonance imaging (MRI) scans were assessed for muscle quality using the Goutallier classification, and graft and cuff integrity was assessed according to the Sugaya classification.

Results: The inclusion criteria were met by 24 patients at 1 year and by 18 (75%) at a minimum of 2 years postoperatively. Patient-reported outcomes were improved compared with preoperative data and were maintained at minimum 2-year fol-

low-up, with median American Shoulder and Elbow Surgeons scores of 42.5 (interquartile range [IQR], 30.8-58.7) versus 93.9 (IQR, 82.4-100) ($P < .001$); median Subjective Shoulder Value scores of 30 (IQR, 20-50) versus 90 (IQR, 86.2-97.2) ($P < .001$); and median visual analog scale pain scores of 5.5 (IQR, 1-9) versus 0 (IQR, 0-0.8) ($P = .001$). Evaluation of graft and tendon healing on postoperative MRI revealed poor interobserver agreement and showed 10 completely healed grafts (42%), 9 partially healed grafts (38%), and 5 completely disrupted grafts (21%), with 42% of supraspinatus tendons and 54% of infraspinatus tendons healed.

Conclusions: SCR with dermal allograft augmentation of complete RCR with poor-quality tissue shows very good clinical outcomes at minimum 2-year follow-up. Poor interobserver agreement regarding postoperative graft and rotator cuff integrity by MRI was found. The healing rate for the SCR grafts was 79%. The rates of healing of the native supraspinatus and infraspinatus tendons were 42% and 54%, respectively.

Level of evidence: Level IV, retrospective case series.

Public Interest in Hyaluronic Acid Injections for Knee Osteoarthritis in the United States and Europe: An International Google Trends Analysis

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Abstract

Background: Hyaluronic acid injections remain a common nonsurgical alternative for the treatment of knee osteoarthritis despite limited clinical evidence and varying global recommendations regarding its use. We used the Google Trends tool to provide a quantitative analysis of public interest in hyaluronic acid injections for knee osteoarthritis in the United States and Europe.

Methods: We customized Google Trends parameters to obtain search data from January 2009 to December 2019 in both the United States and Europe. Combinations of “arthritis”, “osteoarthritis”, “hyaluronic acid”, “knee arthritis”, “knee osteoarthritis”, and “knee injection” were entered into the Google Trends tool, and trend analyses were performed.

Results: The models generated to describe public interest in

hyaluronic acid for knee injections in both the United States and Europe showed increased Google queries as time progressed ($P < .001$). The United States growth model displayed linear growth ($r^2 = 0.90$) while the European growth model displayed exponential growth ($r^2 = 0.90$).

Conclusions: Our results indicate a significant increase in Google queries related to hyaluronic acid injections for knee osteoarthritis since 2009 in both the United States and Europe. Our models suggest that despite mixed evidence supporting its use, orthopedic surgeons should expect continued public interest in hyaluronic acid for knee osteoarthritis. The results of our study may help to prepare surgeons for patient inquiries, inform the creation of evidence-based shared decision-making tools, and direct future research.

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05

Alumni

Alamo Orthopaedic Society



Animesh Agarwal, MD, FAOA, FAAOS
President/Treasurer

The Alamo Orthopaedic Society was established in 1972 by Dr. Charles Rockwood, Jr. as the official alumni association for the Department of Orthopaedics at UTHSCSA. The establishment of Orthopaedics at UTHSCSA pre-dated the actual opening of the school by two years when Dr. Rockwood was recruited to establish an orthopaedic program in 1966.

As I write this update, I realized that it has been a year almost to the date that Dr. Rockwood passed away. The past year has been a difficult one and certainly less jovial without his presence. I would like to mention that the Clinical Orthopaedic Society held its 110th Annual Meeting in San Antonio in September of 2022. Dr. Rockwood posthumously received the Dr. and Mrs. J. Elmer Nix Award. His son Peter Rockwood with his wife Stacey accepted the award on his behalf, while both Drs. Corley and Green spoke in remembrance of Dr. Rockwood. His legacy remains strong and continues in the members of our Alamo Orthopaedic Society. On a somber note, we lost another member of our Alamo Orthopaedic Society family with the passing of Dr. Jim Giles (Class of 1983) in January. He was loved by all that knew him and in Dr. Teuscher's words "He was all that you would want in a mentor to follow." If other members have passed away recently, I apologize for not mentioning them. If you do happen to know of other alumni that have, please let us know.

We launched our new and more robust website, and many have taken advantage of its new payment interface. Additionally, please check it for up-to-date events regarding the society: www.aosalumni.org. Please stay up to date on your dues and call if you have any questions. The society can only maintain hosting its events with your support. Although 2023 would have been our next meeting, COVID had an impact on the society financially in terms of dues payments and thus the decision was made to postpone the 2023 meeting until the

Spring of 2024 which I hope is when our financial situation improves. However, I do want to mention the generosity of Dr. Rockwood's estate in including the AOS in his will with a generous contribution.

The society has approximately 100 active members, which is down from pre-COVID numbers, and is still only a fraction of the over 300 that have graduated from this program. We have had seven AAOS Presidents that have been affiliated with our program, which is an amazing achievement [Hinchev (1971), Rockwood (1984), Morrey (1994), Heckman (1998), Teuscher (2015), Williams (2016), Guy (2021)]. I hope that you were able to attend our Alamo Reception at the AAOS meeting in Chicago this past year. Additionally, Dr. Guy (Class of 1987) held a President's Symposium on Hip Preservation, featuring Dr. Reinhold Ganz as the honoree of the first Dominik Meyer award that was presented by our own Dr. Jesse DeLee (Class of 1975) who chaired the award committee. The award was created by Dr. Christian Gerber, a Rockwood shoulder fellow, and his foundation ResOrtho. This year our 2023 AAOS reception in Las Vegas was held at Brezza, in the new Resorts World hotel complex. Hope those that made it enjoyed the food and comradery. We had a good turnout with about 40 alumni and wives enjoying the great food and venue. I encourage everyone to try and make it to San Francisco next year and attend the AOS reception (venue TBD). I urge many of you that may have let your membership expire to renew and re-engage with the society and the department. Although you will always be an alumnus of the program, dues help to cover expenses for the AAOS reception as well as the biennial meeting. Anna Conti continues to serve as the administrator for the society. Please contact me at agarwal@uthscsa.edu or Anna.Conti@uthscsa.edu for more information.



Dr. Rockwood (R.I.P.) giving a history of the guajolote award at the 2013 Alamo Orthopaedic Society, the last meeting that he was able to physically participate in.



President's Symposium featuring (L to R) John Clohisy, Rick Santore, Robert Trousdale, Reinhold Ganz, Danny Guy, Christian Gerber and Jesse DeLee. (Photo courtesy of Dr. Danny Guy)



Dr. and Mrs. J. Elmer Nix Award presentation at the Clinical Orthopaedic Society 110th Annual Meeting held at the Westin Riverwalk. (L to R) Stacey Voss Rockwood, David Green, Fred Corley, Peter Rockwood, and Robert Harris (COS President 2021-2022).



Multi decade alumni enjoying the reception (L to R): Matt Simonich ('98), Judy Floyd (married to Don Floyd '82), Jeff Phelps ('04), and Matt Simonich ('98).



Jim Giles ('83; R.I.P.) and his wife Lisa at the Alamo Orthopaedic Society Meeting in 2013.



Strong presence by the trauma division (L to R): Sahin Howard (Previous Trauma Fellow in practice in Las Vegas), Boris Zelle (Trauma faculty), Jason Goodrum (PGY-5), Animesh Agarwal ('97), Ravi Karia ('09), Galen Mills (PGY-5).



Our upcoming graduating Class of 2023 at our AAOS Reception in Las Vegas (L to R): David Heath, Galen Mills, Lily Ogden, Adam Ward, Jason Goodrum, Jamie Strauss



Wonderful turnout while James Flanagan ('97 – standing) "interviews" for a new practice partner (seated L to R): Sabrina Heath, Lauren Ward, Adam Ward (PGY-5), Gautham Prabhakar (PGY-4), Galen Mills (PGY-5), David Heath (PGY-5).

Induction to Texas High School Football Hall of Fame



Jesse C. DeLee, MD

Dr. Jesse C. DeLee was inducted into The Texas High School Football Hall of Fame on May 6, 2023. He was the recipient of the Dave Campbell Contributor to the Game Award for his numerous significant contributions to Texas High School Football over his lengthy career.

Jesse C. DeLee, MD was reared in Port Arthur, Texas, and graduated from Thomas Jefferson High School in 1964. He attended the University of Texas in Austin and Lamar College. Dr. DeLee graduated from the University of Texas Medical Branch at Galveston in 1970. There, he was awarded a membership to the Alpha Omega Alpha National Honor Society (AOA) his junior year. He completed his residency at the University of Texas Health Science Center at San Antonio (UTHSCSA) in 1975 followed by a fellowship in joint reconstructive surgery with Sir John Charnley in Wrightington, England. He was awarded the coveted American-British-Canadian Traveling Fellowship in 1983.

From 1978 to 1983, he served as a full-time faculty member at UTHSCSA, where he continues a clinical professorship in orthopaedic surgery and teaches residents. In 1988, he founded the ACGME-accredited Sports Medicine Fellowship at UTHSCSA, which has trained more than forty Sports Medicine Fellows. In addition to his academic accomplishments at the University, Dr. DeLee founded the Nix Hospital Sports Medicine Clinic in 1983, and with his partner Dr. John Evans, he established the DeLee-Evans Foundation for Sports Medicine. The DeLee-Evans Foundation has awarded more than 85 college scholarships to high school students with an interest in athletic training.

Dr. DeLee has contributed to orthopaedic surgery literature with more than 50 peer-reviewed articles and 17 text-

book chapters. He is most proud of founding and co-editing with Dr. David Drez the textbook, *Orthopedic Sports Medicine: Principles and Practice*, currently in its 3rd edition.

Dr. DeLee co-edited the first AOSSM Sports Medicine Fellowship examination. He continues to serve as Co-Chairman of the AOSSM Examination Committee and was inducted into the AOSSM Hall of Fame in 2018. Additional leadership positions held by Dr. DeLee include:

- Reviewer, *The Journal of Bone and Joint Surgery*, *The American Journal of Sports Medicine*, *Arthroscopy Journal*
- Co-editor, *Operative Techniques in Sports Medicine* (1992 – 2012)
- Member, Board of Trustees, *The Journal of Bone and Joint Surgery* (1999 – 2006)
- Member / Committee Member, American Academy of Orthopaedic Surgeons, the American Orthopaedic Association, AOSSM, The Knee Society, American Orthopaedic Foot and Ankle Society, Herodicus Society
- Founding member, Arthroscopy Association of North America
- Chair, UTHSCSA Annual Symposium on Sports Medicine
- Chair, University Interscholastic League (UIL) Medical Advisory Committee, responsible for oversight of all medical aspects of high school athletics in Texas

“When I look back over my career, I see my greatest accomplishment was and continues to be teaching and working with orthopaedic residents. If you teach each resident principles benefitting patients, then you have improved the quality of life of many people. That is a rare privilege.” – Dr. DeLee

UTHSCSA Orthopaedic Surgery Alumni by Class

Class of 1971

Robert D. Bilderback
Michael V. Galo
Thomas R. Reid
Robert G. Stone
Hilario Trevino

Class of 1972

Juan J. Capello
Gary N. Pamplin
Vernon L. Ryan
James M. Steel
Joe W. Tippett
Richard P. Wilson

Class of 1973

Edward D. Campbell, Jr.
Ralph D. Cash
Warren W. Kendall
John T. Phillips
Rafael V. Urrutia, Jr.
Charles M. Younger

Class of 1974

John R. Anderson
George N. Armstrong, Jr.
John E. Blattman
William A. Graham
William H. Matthews
Richard W. Williamson, Jr.

Class of 1975

James W. Adams
Jesse C. DeLee
John A. Genung
Glenn C. Terry

Class of 1976

Billy E. Allison
Robert K. Blair
Jack W. Crosland, III
Ray M. Fitzgerald
John A. Richards

Class of 1977

C. Robert Boone
Phillip R. Craven
Donald R. Davis
Jerold N. Friesen
Raymond S. Gruby
James E. Keever

Class of 1978

William M. Allen, Jr.
Kenneth P. Butters
Fred G. Corley, Jr.
Donald C. Jones
Randy J. Pollet
Archie K. Whittemore

Class of 1979

Ray A. Fambrough
Howard G. Miller
C. Bart Norton
William E. Sanders
Wilburn A. Smith, Jr.
R. Fred Torstrick

Class of 1980

Michael B. Clendenin
Charles E. Lewis
Peter L. J. McGanity
Wayne L. McLemore
James B. Stiehl
John (Jack) M. Thomas, Jr.

Class of 1981

Thomas O. Clanton
Gary H. Jackson
Allen S. Kent
Robert B. Kimmel
Michael R. McLean
Loddie F. Roeder

Class of 1982

Jonathan P. Bacon
Steven C. Dickhaut
Donald W. Floyd
James L. Griffin
Walter M. Knight
Joe B. Wilkinson

Class of 1983

George S. Edwards, Jr.
James B. Giles
Alan G. Lewis
Edward C. Liu
Mark B. Riley
Elizabeth A. Szalay

Class of 1984

Stephen E. Earle
Gary P. Goodfried
Theodore T. Peters
G. Steven White

Class of 1985

Carey C. Alkire
Hal S. Crane
Ralph J. Curtis, Jr.
Michael L. McCarty
Robert E. Mitchell
David R. Schmidt

Class of 1986

Eric C. Carlson
Jeffrey T. DeHaan
Phillip M. Graehl
Michael J. Hanley
Scott H. Kitchel
Matthew C. Reckmeyer

Class of 1987

Jon T. Abbott
Daniel K. Guy
Stephen M. McCollam
Daniel G. Nelson
Jacob F. Patterson
Rex E. Wilcox

Class of 1988

Ples L. Kujawa
James M. Odor
John C. Pearce
Pat A. Peters
Ronald E. Talbert
Donald R. Watson

Class of 1989

Donna M. Boehme
Jimmy H. Conway
Daniel E. Cooper
Stewart M. Dean
Gerald R. Williams

Class of 1990

Jerry A. Benham
Gary T. Brock
Daniel F. Craviotto, Jr.
Kerry M. Donegan
Kurt J. Kitziger
Michael A. Wirth

Class of 1991

Joseph W. Clark
Frank J. Garcia
Carolyn M. Hyde
David E. Nonweiler
James O. Sanders
John C. Sparks, Jr.
Daniel C. Valdez

Class of 1992

Robert L. Burke
N. Thomas Carstens
Mark S. Failingler
Manuel E. Molina
Keith J. Odegard
Barry L. Veazey

Class of 1993

Jerry L. Followwill
Michael G. McNamara
Praveen K. Reddy
Francisco J. Rodriguez, Jr.
Mark J. Rosen

Class of 1994

Keith D. Bjork
Mario A. Bustamante-
Montes, Jr.
Kathryn A. Caulfield
Robert W. Dennis
Eduardo Gomez
Dean N. Walker

Class of 1995

John W. Gardemal
Christopher K. Hersh
John W.P. Horan
Todd C. Johnson
James M. Lovelace
Tommy L. McMillion
Joseph O. Muscat

Class of 1996

Bradley J. Broussard
Robert E. Carlson
Jon M. Goodnight
Randall R. Hardison
Sanjay Misra

Class of 1997

Animesh Agarwal
Theresa L. Colosi
James P. Flanagan
Dale A. Funk
Miguel A. Hernandez, III
Philip M. Jacobs
Ian S. Kovach

Class of 1998

Neil B. Callister
Mark A. Foreman
Melinda D. Garcia
Matthew P. Simonich
Steven J. Wilson
Robert S. Wolf

Class of 1999

Andrea J. Barrett
G. Troy Birk
David J. Clare
Jeffery V. Meincke-Reza
Brian E. Schulze
Thomas C. Young

Class of 2000

Eric A. Eifler
R. Thane Morgan
John Q. Smith
Robert A. Ward
Geroge N. Zoys

Class of 2001

Lance R. Farnworth
John D. Foote
Gary A. Go
Joseph J. Iero
Keith W. Lawson
Charles F. Mess
Jeffrey R. Schlimmer

Class of 2002

David M. Burt
P. Douglas deHoll
Patrick J. Miller
Alexander S. Rowland
Gregory W. Smith

Class of 2003

Jorge E. Casas-Ganem
William H. Hadnott, III
David A. Hester
Keith R. Johnson
R. Bradley Ray
J. David Schillen
Vudhi V. Slabisak

Class of 2004

Armin Afsar-Keshmiri
Gordon R. Bozarth
Mitchell W. Larsen
James M. Mahalek
Jeffrey B. Phelps
Stacé S. Rust

Class of 2005

Brett C. Anderson
Daniel L. Boyd
Ramon A.C. Esteban
Geoffrey M. Millican
Brian T. Rose
Ian C. Weber

Class of 2006

Matthew S. Grunkemeyer
Brandon R. Horne
Hank L. Hutchinson
Russell C. McKissick

Class of 2007

Doug S. Clouse
Gregory D. Gordon, Jr.
Florian G. Huber
William K. Koeck
Edwin C. Newman, III
Erik V. Nott

Class of 2008

Brent M. Adcox
Stephanie H. Alford
Cody N. Anderson
Jerome M. Benavides
Emeka O. Ofobike, Jr.
Anup A. Shah
Eric M. Stehly

Class of 2009

Jamey W. Burrow
John Paul S. Elton
Ravi A. Karia
Abilio A. Reis
Patrick W. Sander
Brandon A. Tinkler

Class of 2010

Matthew C. Murray
Arthur L. Strahan
Ryan B. Thomas
Hussein W. Turki
J. Carr Vineyard
Joshua T. Woody

Class of 2011

Justin R. Brazeal
Michael E. Johnson
Farbod Malek
Guy E. Reyes, Jr.
Brandon M. Seifert
Michael S. Vrana

Class of 2012

Alison L. Cabrera
John W. Hinchey
Jason P. Richards
Jay M. Stanley
Zachary S. Stinson
Darin D. Tessier

Class of 2013

William B. Bell
R. Zachary Garza
Daniel R. Grant
Matthew M. Hussey
Matthew C. Kergosien
James R. Meadows

Class of 2014

Frank A. Buttacavoli
Bradley D. Gilliam
Chad M. Kennedy
Aaron M. O'Brien
David M. Rowley
Ian J. Whitney

Class of 2015

J. Cuyler Dear
Robert G.W. Girling, V
Vishwas B. Patil
Jeremy S. Somerson
Marion M. Swall
Michael A. Weathers

Class of 2016

Davin D. Cordell
Ben S. Francisco
Nicholas E. Gerken
Todd C. Pitts
Gurpreet Singh
Danilo M. Volpini

Class of 2017

Kevin D. Christensen
Richard E. Edeen
Jason R. Gray
Brandon D. Mennear
Evan M. Tavakoli
Zibin Zhao

Class of 2018

Katherine C. Bartush
Christina I. Brady
Gregory V. Gomez
Brett M. Hall
Christopher G. Larkins
Gina R. Lesko

Class of 2019

Thomas L. Hand
Andrew M. Lee
Hanna E. Mendez
Chance C. Moore
Jason Thompson
Antonio J. Webb

Class of 2020

Khang H. Dang
Stephen Ernst
Brock T. Kitchen
Kenneth S. Mensch
Alexander V. Nguyen
Nikhil Shelke

Class of 2021

Braden J. Boyer
Ryan C. Egbert
Andrew J. Haus
Isaac S. Kim
Case W. Martin
James C. Ryan

Class of 2022

Jorge C. De Leon
Joel I. Edionwe
Jordan E. Handcox
Dietrich W. Kayser
Riikka E. Koso
Trevor J. Wait

Class of 2023

Jason Goodrum
David Heath
Galen Mills
Liliana Ogden
Gus Jamie Strauss
Adam Ward

Alumni



In memoriam of my mentor, Elizabeth Szalay, MD
by Christina Brady, MD

As a medical student at the University of New Mexico, I was fortunate to have been matched with Dr. Szalay as my clinical preceptor. In her clinic, she had a poster from the Ruth Jackson Society inspired by Rosie the Riveter with the words “Orthopaedic Surgery is Women’s Work, too.” Dr. Szalay encompassed the spirit of that poster.

She inspired countless students, including myself, to pursue orthopaedic surgery.

This year for the alum update, we wanted to include a remembrance of the first female from this program, Elizabeth Szalay, MD.



Dr. Szalay was a native of Los Alamos, New Mexico, known for world-renown research and, specifically, the development of the atomic bomb. She received her undergraduate and medical degrees from the University of New Mexico.

For residency, she was the first female orthopaedic surgery resident at the University of Texas Health Science Center San Antonio in the 13th class of 1983. She completed her fellowship in pediatric orthopaedic surgery at Scottish Rite Hospital in Dallas. Out of fellowship, she worked at Vanderbilt University and then at Beaumont Bone and Joint Institute in Beaumont, Texas. Everywhere she went, she left lasting impressions through her kindness and competency. After returning to her alma mater, she continued to forge the path for women. She served as the Division Chief of Pediatric Orthopaedic Surgery at the University of New Mexico Carrie Tingley Hospital. She was the first woman full professor on a tenure track in orthopaedic surgery at UNM.

Dr. Teresa Balcomb, Dr. Szalay’s medical school classmate, described her as “a brilliant person; a brainiac with the rare combination of smarts, talent, and empathy.”

During her career, Dr. Szalay published more than 40

peer-reviewed research articles. She specifically contributed to the literature on osteoporosis and vitamin D deficiency in at-risk pediatric populations and the clinical applications of bisphosphonates and DEXA scans. In addition to her research and writing textbooks, Dr. Szalay dedicated her service to the orthopaedic surgery community as a reviewer for the *Journal of Pediatric Orthopaedics* and the *Journal of Bone and Joint Surgery*. She served as a board examiner for the American Board of Orthopaedic Surgery. As a member of the American Academy of Orthopaedic Surgeons, she served on the national Board of Councilors and the Women’s Health Advisory Board. She was also a national spokesperson for Culturally Competent Care in orthopaedics.

Dr. Szalay was committed to helping underserved communities. She participated in eight surgical mission trips to Ecuador. Within rural areas of New Mexico, she provided surgical care for patients who could not travel to UNM for care.

Shortly before her death, she was selected as the honoree for the 2015 Humanitarian Award bestowed by the Pediatric Orthopaedic Society of North America for her work with children in Ecuador and New Mexico.

Outside of medicine, Dr. Szalay was happily married to Ken Gilman. They were classmates reunited at their 30th high school reunion in Los Alamos and were married four years later.

She referred to their relationship as a “Godplop,” which plops into your lap unexpectedly.

During her free time, Dr. Szalay was a passionate musician trained in classical guitar and later switched to the mandolin due to its versatility. She performed with the Guadalupe Mandolin Orchestra, the Celtic band A Pint Short, and St. Michael & All Angels Episcopal Church ensemble.





Class of 1983: George S. Edwards, Jr., James B. Giles, Alan G. Lewis, Edward C. Liu, Mark B. Riley and Elizabeth Szalay.



Class of 1983: George S. Edwards, Jr., James B. Giles, Alan G. Lewis, Edward C. Liu, Mark B. Riley and Elizabeth Szalay.



Dr. Szalay with patient on a mission trip in South America.



Dr. Szalay with patient on a mission trip in South America.



Dr. Szalay with Dr. Wilkins at an international pediatric conference.



Dr. Szalay with her band, A Pint Short.

Endowments

Orthopaedics

THE FRED G. CORLEY, M.D. CHAIR IN ORTHOPAEDICS, #57700223. This endowment was established in July 2004. Ravi Karia, M.D. was appointed holder of this prestigious endowment on December 1, 2020. This endowment was established to honor Dr. Corley who is one of our most respected long-term faculty. He has special expertise in surgery of the upper extremities, especially in management of trauma of the elbow, wrist, and hand. He serves as a role model for Medical Students and Residents and has been the Chief of the Hand Services at this institution for over two decades. The purpose of this endowment is to support the Distinguished Professorship and establish a permanent education resource for training Residents and Medical Students in surgery of the hand, shoulder and elbow.

JOHN J. HINCHEY, M.D. AND KATHRYN HINCHEY CHAIR IN ORTHOPAEDICS, #57700024 QUASI, #57700444, are held by Robert H. Quinn, M.D. These endowments were established in 1992 to honor Dr. Hinchey for his tremendous contributions to Orthopaedics and to the total medical community during his many years of Orthopaedic practice in San Antonio. Dr. Hinchey died on March 3, 2000; Mrs. Kathryn Hinchey died in December 2011. The purpose of the endowment is to establish an endowed position in the Department of Orthopaedics to support clinical and basic research.

CHARLES A. ROCKWOOD, JR., M.D., CHAIR IN ORTHOPAEDICS, #57700058 AND CHARLES A. ROCKWOOD, JR., M.D. CHAIR IN ORTHOPAEDICS QUASI, #57700574. Anil K. Dutta, M.D. was appointed to this prestigious endowment on December 1, 2020. These endowments were established in 2003 to honor Dr. Rockwood who is recognized internationally for his contributions to Orthopaedic Surgery. Dr. Charles A. Rockwood, Jr., Emeritus, Department of Orthopaedics at UT Health San Antonio died on February 1, 2022; his name, inventions and textbooks will persist for decades to come. The endowments were created to support research and education specializing in shoulder disorders in the Department of Orthopaedics at UT Health San Antonio. These endowments were previously held by Michael A. Wirth, M.D. who retired on June 30, 2019.

PRESIDENT'S COUNCIL/DIELMANN CHAIR IN PEDIATRIC ORTHOPAEDIC SURGERY, #57700241. Sekinat K. McCormick, M.D. was appointed holder of this prestigious endowment on October 1, 2021. This endowment was established in 2005 to honor Henry B. and Edna Smith Dielmann. Mrs. Dielmann, a community philanthropist died in 2002 and left a generous portion of her estate to UTHSCSA. She was

the widow of Henry B. Dielmann, a prominent San Antonio attorney, three-time member of the Texas House of Representatives and former Dean of St. Mary's University Law School in San Antonio. This endowment was created to provide Pediatric Orthopaedic training and programs to Medical Students and Residents at UT Health San Antonio as well as specialty training to countries with limited resources.

ERWIN ORTHOPAEDIC SARCOMA RESEARCH ENDOWMENT IN HONOR OF DR. RAJIV RAJANI, #57700616. This QUASI endowment was received from the Erwin Family Foundation in honor of Dr. Rajiv Rajani. Funds distributed from the endowment will be used to provide support for research, visiting professors, and work dedicated to treatment options for bone and soft tissue sarcomas, under the direction of the Chair of the department in accordance with the Regents' Rules and Regulations.

FRANCES AND BLACKSTONE DILWORTH PROFESSORSHIP IN ORTHOPAEDIC ONCOLOGY, #57700639. Robert H. Quinn, M.D. was appointed holder to this prestigious endowment on March 1, 2021. Funds distributed from this endowment shall support the Professorship in accordance with the Regents' Rules and Regulations and applicable policies pertaining to endowed academic positions. As additional funds are received, this endowment will be elevated to the highest level of endowment for which it qualifies.

KAYE E. WILKINS, D.V.M., M.D. ORTHOPAEDIC PROFESSORSHIP, #57700675. This prestigious endowment was created to honor the legacy of Dr. Wilkins by contributing to the musculoskeletal care of children. Funds distributed from the endowment shall be used to support the Professorship in accordance with the Board of Regents' Rules and Regulations and applicable policies pertaining to endowed academic positions. Distributions may also be used to support residents within the school. Endowment is unfilled.

STEVE AND MARY ANNE LYNCH PROFESSORSHIP IN MEDICINE, #57700706. Katherine C. Bartush, M.D. was appointed holder to this prestigious endowment on January 1, 2022. This endowment was created to benefit a promising "rising star" faculty who is dedicated to excellence in patient care, teaching and mentoring students/residents with special interest in Orthopaedics and other clinical specialties at UT Health San Antonio. Funds distributed from the endowment will support the Professorship in accordance to the Regents' Rules and Regulations and applicable policies pertaining to endowed academic positions.

DR. ROBERT AND DR. LOUISE HUTCHINSON ENDOWMENT FUND FOR BASIC RESEARCH IN ORTHOPAEDIC SURGERY, #57700729. This is a Miscellaneous Endowment created from their Charitable Trust Fund in September 2022. Funds distributed from the endowment shall be used for basic research in Orthopaedic Surgery.

Orthopaedics Supporting Honorary Lectureships

THE CHARLES A. ROCKWOOD, JR., M.D. ENDOWED LECTURE SERIES, #57700233 was established in November 2004. We appreciate Dr. Rockwood's recognition of the Orthopaedic Residents as they graduate from our Residency Program. Dr. Charles A. Rockwood, Jr., Emeritus, Department of Orthopaedics at UT Health San Antonio died on February 1, 2022; his name, inventions and textbooks will persist for decades to come. This endowment was created to defray all or part of the expenses associated with the annual Orthopaedic Resident Graduation. This includes expenses to invite a distinguished guest lecturer and expenses associated with the Grand Rounds lecture, evening lecture and Graduation. Holder is not required.

THE PHILIP A. DEFFER, SR., M.D. LECTURE SERIES, #57700070 was established in 1994. Dr. Deffer was a Retired Brigadier General, Associate Professor in the Department of Orthopaedics and Rehabilitation at the Health Science Center and Director of the Orthopaedic Clinics at the University Health Center-Downtown from 1982-2003. Dr. Deffer died on October 26, 2006. The sole purpose for this endowment is to defray or offset expenses associated with inviting a distinguished guest speaker to the annual educational lecture to interact, share experiences and offer insights with our Residents and Medical Students. Holder is not required.

THE LAURA B. FLAWN, M.D. ENDOWED DISTINGUISHED PROFESSORSHIP IN DISEASES OF THE SPINE AND SPINE TRAUMA, #57700189 was established in 2002. Christopher Chaput, M.D. was appointed to this prestigious endowment effective January 1, 2019. Dr. Flawn received high praise for her surgical skill and her contributions to the advancement of surgery of the spine before and after her death on October 20, 2001. She was active in the Scoliosis Research Society and pioneered the development of practices and procedures to improve the treatment of scoliosis. The purpose of this endowment is to support the Distinguished Professorship and hold the annual Laura B. Flawn, M.D. Lecture. The annual lecture benefits Medical Students, Residents and Faculty at UT Health San Antonio. It is funded by Dr. and Mrs. Peter Flawn, Dr. John P. Howe, III and Ms. Tyrrell Flawn.

Podiatry

LOUIS T. BOGY, D.P.M. PROFESSORSHIP IN PODIATRIC MEDICINE AND SURGERY, #57700098. Crystal Ramanujam, D.P.M. was the previous Holder until her termination June 30, 2022. Lee C. Rogers, DPM, FPPM, RCPS was appointed to this prestigious endowment on August 1, 2022. This Professorship was established in 1998 to honor Louis T. Bogy, Chairman Emeritus of the Podiatry residency training

program at UTHSCSA. Dr. Bogy was instrumental in establishing the residency training program, which began in 1972 with one Resident. More than 100 Residents have graduated since 1972. Dr. Bogy died on February 9, 2004. The first supported faculty member to be supported by this Professorship was Lawrence Harkless, D.P.M. from 1999 to 2007. This endowment was created to support the Professorship, research and resident education in the area of diabetic foot care.

LEE J. SANDERS, M.D. PROFESSORSHIP IN LOWER EXTREMITY AMPUTATION PREVENTION, #57700196.

Thomas Zgonis, D.P.M. was Holder of this prestigious endowment since 2008 until his termination June 30, 2022. Endowment is currently unfilled. The Professorship was established in 2003 to honor Lee J. Sanders, D.P.M, Chief of podiatry service, acute care and specialty services at the Veterans Administration Medical Center in Lebanon, PA. Dr. Sanders is one of the foremost leaders in prevention of lower-extremity amputation in diabetics. The purpose of the Professorship would be to support a faculty member in the Podiatry Division of the Orthopaedic Department and to support podiatric research and education in amputation prevention and other podiatric needs deemed appropriate by the Chair of Orthopaedics.

THE LAWRENCE B. HARKLESS D.P.M. ENDOWED PROGRAM FUND IN PODIATRY, #57700476.

Endowment was created March 26, 2014 with a \$10,000 gift from G. Javier Cavazos, Jr., D.P.M. received in November 2007 to support an endowment for the Orthopaedics Department, Podiatry Division in the School of Medicine. Future plans will be to use this endowment for Podiatry Faculty research, travel and miscellaneous expenses to support the academic mission of the Program Fund in Podiatry.

Endowments are supported through the Office of Development:

Interested in Giving?? To make a gift to any of our prestigious endowments, please contact Philip Garza, Senior Director of Development, Long School of Medicine, UT Health San Antonio, Office of Institutional Advancement, 7703 Floyd Curl Drive, MC 7835, San Antonio, TX 78229-3900, garzap6@uthscsa.edu, 210-567-2598 -or- Norma Nami, Department of Orthopaedics, UT Health San Antonio, 7703 Floyd Curl Drive, MC 7774, San Antonio, TX 78229-3900, nami@uthscsa.edu, 210-567-5145. Thank you!

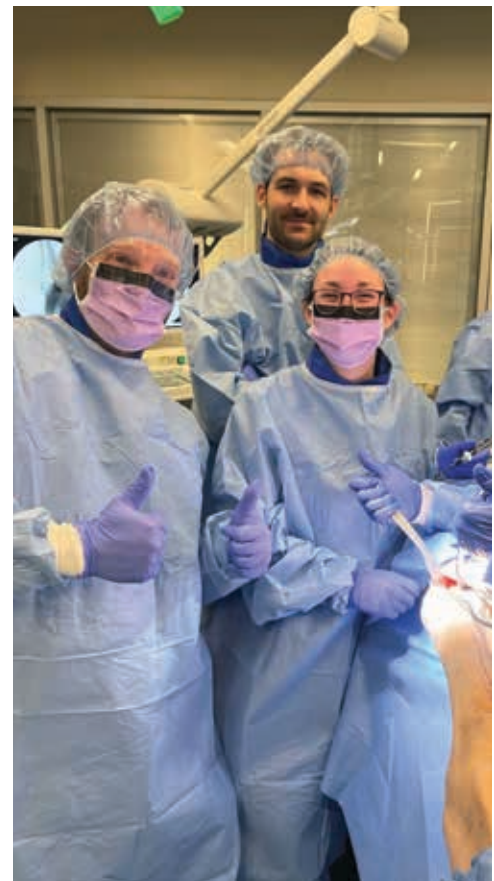
Ortho Illustrated



Elya Reznichenko, Luke Verlinsky, Will Young, and Sunny Makhani after a suture lab.



Mayo Galindo teaching Annat Houston ankle arthroscopy.



Frank Buttacavoli teaching some residents (left to right: Jack Parker, Kathleen Lundquist, and Chimobi Emukah) at a direct anterior total hip lab.



Liliana Ogden, Steve Gibbons, Matt Landrum, and Annat Houston spreading some Christmas spirit at University Hospital.



Gathering for "Galentine's Day"



Residents and families at a Halloween party.



J.T. Goodrum, David Heath, Steve Gibbons, Jacob Brennan, and Galen Mills enjoying some crawfish at the Gibbons' house.

In Honor of our Fallen Heroes: The Murph Challenge



Boris A. Zelle, MD

In honor of our fallen heroes, it has become a recent tradition that a group of orthopaedic residents and attendings from our department compete in the Murph Challenge on Memorial Day. The formidable physical challenge is the official fundraiser for the LT. Michael P. Murphy Memorial Scholarship Foundation.

THE STORY

LT. Michael P. Murphy (SEAL) was the officer-in-charge of a four-man SEAL team running an operation near Asadabad, Afghanistan. After inserting into the objective area, the SEALs were spotted by three goat herders who were initially detained and then released. It is believed the goat herders immediately reported the SEALs' presence to Taliban fighters. A fierce gun battle ensued on the steep face of the mountain between the SEALs and a much larger enemy force. Murphy is credited with risking his own life to save the lives of his teammates. Murphy attempted to contact headquarters for support but realized that this was impossible in the extreme terrain. With complete disregard for his own life, he moved into the open, where he could transmit a call to get help for his men. Moving away from the protective mountain rocks deprived him of cover and exposed him to enemy gunfire. Murphy made contact with the SOF Quick Reaction Force at Bagram Air Base and requested assistance for his team. Severely wounded, LT. Murphy returned to his cover position with his men and continued the battle. LT. Murphy fought on, allowing one member of his team (Marcus Luttrell) to escape. LT. Michael Murphy was posthumously awarded the Congressional Medal of Honor on October 27, 2007.

THE WORKOUT

It is important to remember that The Murph Challenge is more than just a workout. It is a tradition that helps push us, humble us, and allows us the opportunity to dedicate a bit of

pain and sweat to honor LT. Michael P. Murphy (SEAL) – a man who sacrificed his life for our freedom.

THE MURPH CHALLENGE

1 Mile Run.
100 Pullups.
200 Pushups.
300 Squats.
1 Mile Run

THE EVENT

The event which started as a memorial to LT. Michael P. Murphy Michael has grown into worldwide participation with thousands involved from every part of the globe. The Murph Challenge campaign has raised substantial funds for the LT. Michael P. Murphy Memorial Scholarship Foundation.

Participating in this campaign, a group of ten orthopaedic residents (Jacob Brennan, Jorge De Leon, Ezekial Koslosky, Kathleen Lundquist, Galen Mills, Annat Houston, Clinton Ulmer, Loc-Uyen Vo, Trevor Wait, Meagan Womack) and three orthopaedic attendings (Thomas Hand, Matt Landrum, Boris Zelle) gathered on Memorial Day to accept this challenge. As expected, Dr. Zeke Koslosky (class of 2025) was the undisputed winner and impressively finished the workout within 31 minutes. More importantly, the orthopaedic department raised \$1,000+, which were donated to the LT. Michael P. Murphy Memorial Scholarship Foundation. We are looking forward to keeping up this tradition in the years to come.

SOURCES: <https://themurphchallenge.com/>



Dr. Koslosky after winning The Murph



Residents and Faculty at The Murph

Visiting Professors

25th Annual Philip A. Deffer, Sr., M.D. Endowed Lectureship

We felt very honored to welcome Dr. H. Claude Sagi from the University of Cincinnati as our Visiting Professor for the 25th Annual Philip A. Deffer, Sr., M.D. Endowed Lectureship on April 17, 2023. Dr. Sagi is a worldwide expert in the field of pelvic and acetabular reconstruction. He delivered a superb lecture on “Pelvic and Acetabular Mythology” and moderated excellent case discussions with our orthopaedic residents. Thank you, Dr. Sagi.



Visiting Professor Dr. H. Claude Sagi from Wake Forest University provided a very insightful lecture on femoral neck fractures on August 22, 2022.



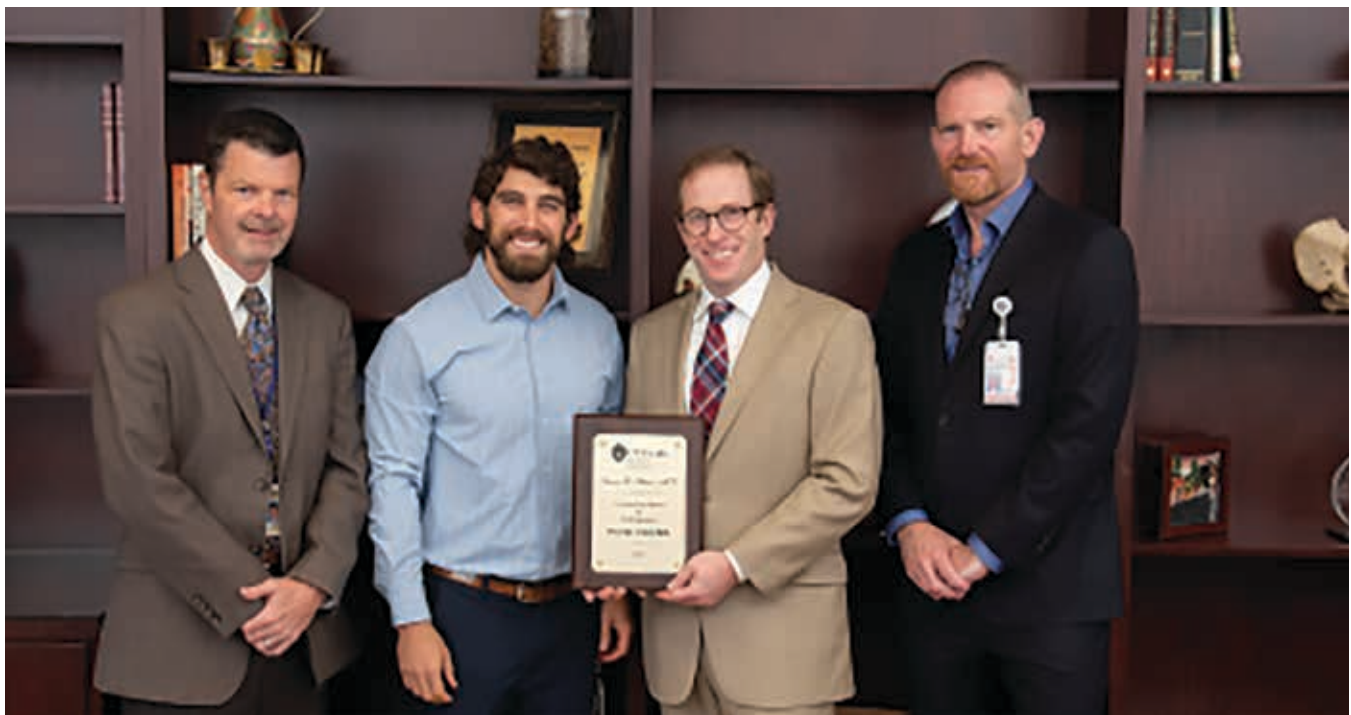
Drs. Robert Quinn, H. Claude Sagi, and Boris Zelle.



Drs. Animesh Agarwal, Eben Carroll, Boris Zelle, Ravi Karia, and Peter Wasky.



We felt honored to welcome Dr. Joseph Benevenia as our Visiting Professor for 2022 Annual Philip A. Deffer, Sr., M.D. Endowed Lectureship. He was hosted by Dr. Robert Quinn, Department Chair.



We felt privileged to welcome Dr. Patrick J. Cahill, Visiting Professor for 2022 Laura B. Flawn, Endowed Lectureship, hosted by Drs. Robert Quinn, Matthew Landrum, and Christopher Chaput.

DONJOY CMF

BONE GROWTH STIMULATOR

CASE STUDY >

29 year old female presents with traumatic distal tibia and fibula fracture after a horseback riding accident. The patient underwent surgical repair in July, 2019. At her 90-day follow-up there was persistent fractureline at the proximallateral tibial fracture as well as the fibular fracture. Bone stimulator therapy was initiated. Films at 90 days post initiation of the bone stimulator you can visualize complete consolidation of the fractures.

INITIAL RADIOGRAPHS



HEALED FRACTURE: 90 DAYS POST TREATMENT



THE OL1000 >

DID YOU KNOW?

The risk of nonunion following a fracture is estimated to be up to 12% depending on the anatomical location of the fracture and patient-specific risk factors. At DJO, we love solving difficult problems. It took time and commitment to offer doctors and patients dealing with a tough break another option than additional surgeries or living with the pain. High risk patients can have conditions that can inhibit proper bone unionization, causing nonunions. The OL1000 is a bone growth stimulator that is specifically designed to help heal nonunion fractures. DJO's Combined Magnetic Field Technology is the most advanced bone stimulation technology on the market. Success rates as high as 89% have been achieved in only 30 minutes wear time per day.

INDUSTRY >

Your **30 MINUTE** once a day solution to successful nonunion fracture healing

89% success rate as high as 89.7% in treating nonunion fractures

23% documented tibial nonunion fracture rate

16% rate of open nonunion fractures with extensive soft tissue damage

8% observed rates of femoral shaft nonunion with the use of IM nailing

FEATURES >

THE BENEFITS

- Benefits and features of the CMF technology include:
- 5 different coil sizes - to accommodate fractures of any anatomical location and size
 - Large field of treatment influence - the CMF signal does not attenuate through tissue
 - Can be applied over a cast or brace and does NOT require direct skin contact or application of gel
 - Ideal for older patients and/or obese patients who may have a difficult time reaching their lower extremities

CHALLENGE ACCEPTED

OL1000™ was designed to help treat tough fractures!



Please contact Matt Warren for more information - (210) 262-4962



