

Orthopedic Surgery Update

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Managing Complex Distal Radial Fractures

Mayo Clinic's orthopedic surgeons have expertise in treating even the most complex distal radial fractures. As members of a fully integrated practice, the surgeons also collaborate with other specialists to manage the care of individuals with comorbidities that can increase the risks of wrist surgery.

"All of the surgeons here can manage complicated as well as simple fractures," says David G. Dennison, M.D., an orthopedic surgeon at Mayo Clinic in Rochester, Minnesota. "We routinely operate on patients who have diabetes, cardiac conditions or other medical problems. We also care for polytrauma patients. With everything under one roof, we're able to treat all of those patients' injuries in addition to managing the fractures."

Mayo Clinic's approach to distal radial fractures includes taking the time to discuss with individuals their specific injuries. "We work with our patients to explain their options for treatment, any potential

risks and the anticipated outcomes," Dr. Dennison says. "It's important from the beginning to provide a predictable surgical procedure and postoperative rehabilitation protocol when needed, and to balance patients' expectations with the expected treatment outcomes. The good news is that many wrists have very good function after treatment."

UP AND GOING AGAIN

At Mayo Clinic, state-of-the-art technology facilitates timely imaging of distal radial fractures. Cone-beam CT scans can be performed in the room where casts are applied. "That imaging allows us to very quickly look at any details of the injury, such as an articular fracture versus a simple transverse fracture," Dr. Dennison says.

For complex fractures, treatment plans encompass the entire process of multidisciplinary care. "Before surgery we make sure that our anesthesiologists and our rehabilitation specialists are aware of our patients' needs. We use a coordi-



Figure 1. X-ray shows a displaced fracture of the distal radius.



Figure 2. X-ray taken after open repair of the fracture shows a plate and screws to provide stability until the bone is healed.



David G. Dennison, M.D.

nated approach for fracture repair and recovery,” Dr. Dennison says.

Patients’ activity levels and desired wrist function are key factors in determining treatment. “We look closely at the extent of joint displacement to determine the odds of developing arthritis or difficulty with wrist rotation,” Dr. Dennison says. “Anatomical alignment is important for active individuals who want to resume certain activities (Figures 1 and 2, see page 1). As people age and are less active, deformities are usually tolerated better. We might allow for less precise alignment for less active patients who are in their 70s and 80s.”

Patients referred for revision surgery constitute a large portion of Mayo Clinic’s distal radial fracture practice. “These patients may have had poor healing due to misalignment in the cast or a complication from the hardware,” Dr. Dennison says. “Although we are usually able to help these patients, it’s ideal to see patients at the time of fracture because fractures are usually easier to treat the first time.”

For some patients, postoperative rehabilitation with a hand therapist is an important aspect of care. “The key is identifying people who need therapy,” Dr. Dennison says. “With instruction, people who had straightforward surgeries or casts will achieve their desired range of motion very nicely on their own within 6 to 9 months of completing treatment. Therapy, though, often speeds up the recovery of function — especially for people who were in casts or surgical dressings for long periods of time — and can minimize problems with stiff hands and shoulders.”

Postoperative care might also include referrals to Endocrinology. “We like to maintain a close eye on bone health for patients who are at risk of more fractures,” Dr. Dennison says.

For all individuals with distal radial fractures, Mayo Clinic strives to restore the optimal desired wrist function. “Whether the fracture is part of an acute polytrauma or the result of a fall by an older person or a weekend warrior, we provide integrated care to get our patients up and going again,” Dr. Dennison says.

Managing Weight and Diabetes Before Joint Replacement Surgery



Rafael J. Sierra, M.D.

Mayo Clinic has launched a multidisciplinary effort to reduce the risk of postoperative infections in patients with underlying conditions who have hip or knee replacements. The most common underlying conditions that increase that risk are obesity (Figure, see page 3) and diabetes.

“These infections are devastating. We are committed to decreasing the risk factors for poor prognosis in this subset of patients,” says Rafael J. Sierra, M.D., chair of Adult Reconstruction, Orthopedic Surgery, at Mayo Clinic in Rochester, Minnesota. “The goal is for the patient ultimately to get the hip or knee replacement. But first we want to work on the comorbidities to optimize surgical outcomes.”

Patients who are identified as being at high risk — and who agree to work on their risk factors before having joint replacement surgery — are referred to Mayo Clinic’s Endocrinology, Diabetes, Metabolism, and Nutrition, one of the largest divisions of its kind in the world.

“We work with these patients not only to optimize their weight management and diabetes care but also to help them develop new goals and regain function,” says Juan P. Brito Campana, M.B.B.S., an endocrinologist at Mayo Clinic’s campus in Minnesota. “In addition to addressing biomedical issues, we address the wider context of these individuals’ lives.”

The approach requires balancing individuals’ desire for joint replacements that can ultimately relieve pain with surgeons’ desire to maximize outcomes. “In the past, we’ve seen a lack of communication about what patients want and what surgeons want,” Dr. Sierra says. “But respectful conversations with patients can help them set goals and help us better prepare them for orthopedic surgery.”

PATIENT-CENTERED RESPECTFUL APPROACH

Mayo Clinic appointment coordinators screen individuals referred for joint replacement to identify potential risk factors. Specific questions involve height and weight, use of tobacco and narcotics, and level of

diabetes control if that condition is present. Individuals identified as being at high risk are contacted by a specially trained orthopedic nurse, who explains the approach for reducing risk.

“The nurse follows a script that has been vetted by our orthopedic and endocrinology groups. There are specific words that can and cannot be used,” Dr. Sierra says.

Patients who wish to learn more have a virtual meeting with an endocrinology nurse, who forwards information about the risk reduction program. Individuals can then decide whether to join.

“Some patients are happy to have this focus on risk reduction. For others, it’s a hard sell,” Dr. Sierra says. “Many patients have been denied a joint replacement elsewhere because of their risk factors and have come to Mayo Clinic as a last resort.”

The risk of infection after joint surgery for people with a body mass index (BMI) above 40 or 50 is as much as triple the risk for people with lower BMI. “Sometimes patients tell us they’ll take that risk,” Dr. Sierra says. “They don’t understand that if they get an infection, they might face more surgery or even potentially amputation.

That’s why education is very important.” Individuals who join the risk-reduction program see specialists in Mayo Clinic’s advanced weight management program and the Diabetes Mellitus Specialty

Group, part of Mayo’s highly ranked endocrinology division.

“We have a multidisciplinary team of endocrinologists, dietitians, psychiatrists, and physical medicine and rehabilitation specialists to help patients in this transition to orthopedic surgery care,” Dr. Brito Campana says. “These patients have pain and difficulty moving around and might have issues with getting or maintaining a job. We work with them to optimize their weight management and diabetes care — and at the same time to maximize the overall functioning of their lives.”

Once patients achieve their goals, Orthopedic Surgery schedules their joint replacements. The process is individualized to each patient.

“We can’t have the same goals for everyone,” Dr. Sierra says. “Helping a person lower BMI from 60 to 45 is a big deal. For a person who starts at a BMI of 40, getting down to 30 makes a difference.”

As a fully integrated center of excellence, Mayo Clinic can provide multispecialty expertise for challenging issues. “We see patients at high risk who had hip or knee replacements elsewhere and were referred to us because of complications,” Dr. Sierra says. “Once the complications occur, we are limited in what we can do. We’d rather do the primary hip or knee replacement here once we have worked to optimize outcomes.”



Juan P. Brito Campana, M.B.B.S.

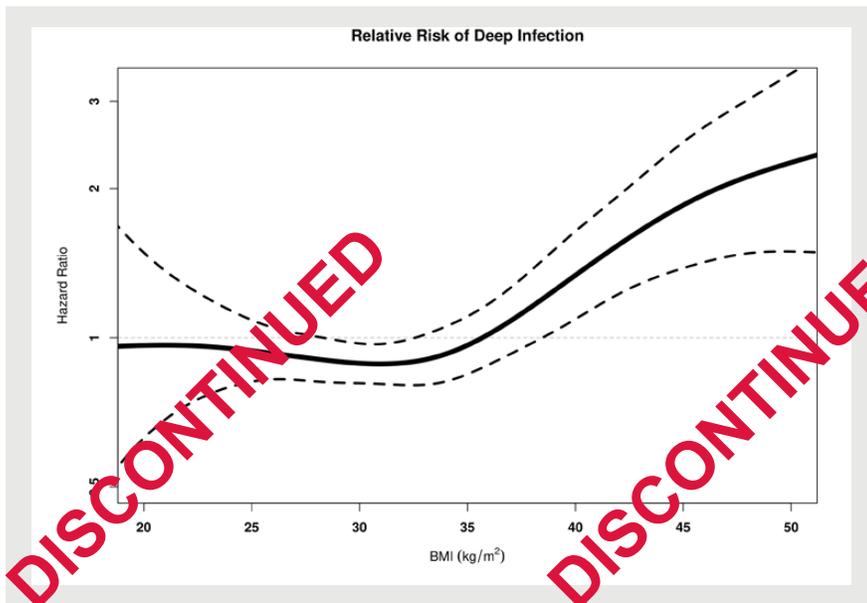


Figure. The solid line in the graph shows the hazard ratio for deep infection as a function of body mass index after total knee arthroplasty. The dotted black lines indicate the 95% confidence interval. The dotted gray line indicates where the line would be if there were no increased or decreased risk of infection.

Managing Post-Surgical Pain Without Opioids



Mayo Clinic’s multimodal pain protocol avoids the use of opioids while successfully managing patients’ pain after the most common orthopedic sports procedures.

“As health care providers, we are in a unique position to have a large impact on the opioid epidemic by limiting our prescriptions of these drugs. We have a chance to improve quality of life and to save lives,” says Kelechi R. Okoroa, M.D., an orthopedic surgeon at Mayo Clinic Orthopedics and Sports Medicine in Minneapolis.

Mayo Clinic currently uses the nonopioid pain protocol for anterior cruciate ligament (ACL) reconstructions, meniscus surgeries, and labral and rotator cuff repairs. “We’re hoping to expand it to all of sports medicine and to other areas of orthopedics,” Dr. Okoroa says.

The protocol comprises preoperative analgesics, intraoperative local infiltration analgesia and a postoperative pain regimen. In a study published in the August 2020 issue of *Arthroscopy: The Journal of Arthroscopic & Related Surgery*, Dr. Okoroa and colleagues demonstrated that a similar protocol resulted in low levels of pain and minimal use of rescue opioids. “We found that patients required only one or two doses of narcotics postoperatively,” Dr. Okoroa says.

Follow-up prospective, blinded, randomized clinical trials are underway comparing

the multimodal nonopioid pain protocol to standard-of-care pain management in each of the four types of sports medicine procedures. The meniscus surgery study, published in the July 2021 issue of *Arthroscopy: The Journal of Arthroscopic & Related Surgery*, found that the multimodal nonopioid protocol provided equivalent pain control compared to opioids. Similar results were obtained in the other three studies, which will be published in the future.

“In essence, we were able to manage patients’ postoperative pain without opioids,” Dr. Okoroa says.

SYNERGY BETWEEN ELITE AND NONELITE ATHLETES

As a team physician for the Minnesota Timberwolves, Dr. Okoroa assists with optimizing performance and the management of injuries for National Basketball Association players.

“Ultimately, we’re trying to keep our players on the court and off the sidelines,” he says. “But there’s a definite synergy with the treatment of other athletes. In high-level athletics, we’re always looking for new and improved treatment techniques. We can extrapolate what works for those athletes to our nonelite athletes.”

That commitment to maximizing players’ health and performance extends to female athletes. Dr. Okoroa has co-authored studies that document the effects of

orthopedic injuries on the careers of Women's National Basketball Association (WNBA) athletes.

One study, published in the June 2021 issue of *Orthopaedic Journal of Sports Medicine*, found that WNBA athletes with a history of an ACL tear before professional play had decreased game utilization throughout their careers, despite having statistical performance similar to that of healthy controls. Another study, published in the March 2021 issue of *Orthopaedic Journal of Sports Medicine*, found that most WNBA players who sustained an Achilles tendon rupture had shorter careers compared with those of healthy controls.

"It's important to do the same level of research in female athletes as in our male athletes," Dr. Okoroha says. "Female athletes are at increased risk of certain injuries — including ACL tears — but our research efforts in female athletes are limited compared with those in males. Our role as researchers is to find ways to prevent those injuries."

Dr. Okoroha is also at the forefront of Mayo Clinic's efforts to increase diversity among health care providers. Historically, orthopedic surgery has had a low percentage of specialists who are female or people of color. Mayo Clinic is now participating in Nth Dimensions, an organization founded by orthopedic surgeons to increase diversity in the specialty.

Nth Dimensions pairs rising second-year medical students with orthopedic surgeon mentors. A former Nth Dimensions scholar, Dr. Okoroha now serves as a mentor at Mayo Clinic.

Foot and Ankle Care: From Sports Medicine to Complex Anomalies

As a major tertiary center, Mayo Clinic in Jacksonville, Florida, has experience and expertise with the gamut of foot and ankle conditions. Mayo's patient-centered approach helps injured athletes return to play and helps young people with Charcot-Marie-Tooth disease gain optimal foot and ankle function.

"We are committed to providing destination medical center care, regardless of the

"Our mentees get a great exposure to all aspects of orthopedics," he says. "They are able to see patients in the clinic, shadow surgeries and gain research experience. We hope this reinforces our mentees' desires to become orthopedic surgeons."

Nth Dimensions scholars also receive guidance on applying to residencies. "Between 90% and 95% of Nth Dimensions scholars match with an orthopedic residency," Dr. Okoroha says. "Nth Dimensions is a great fit for Mayo Clinic because Mayo has made a real commitment to increasing diversity, particularly in orthopedics."

FOR MORE INFORMATION

Moutzouros V, et al. A multimodal protocol to diminish pain following common orthopedic sports procedures: Can we eliminate postoperative opioids? *Arthroscopy: The Journal of Arthroscopic & Related Surgery*. 2020;36:2249.

Jildeh TR, et al. Multimodal nonopioid pain protocol provides equivalent pain to opioid control following meniscus surgery: A prospective randomized controlled trial. *Arthroscopy: The Journal of Arthroscopic & Related Surgery*. 2021;37:2237.

Tramer JS, et al. Association of prior anterior cruciate ligament tear with decreased career longevity in Women's National Basketball Association. *Orthopaedic Journal of Sports Medicine*. 2021;9:23259671211009248.

Tramer JS, et al. Effect of Achilles tendon rupture on player performance and longevity in Women's National Basketball Association players. *Orthopaedic Journal of Sports Medicine*. 2021;9:2325967121989982.

complexity of the injury," says Edward T. Haupt, M.D., an orthopedic surgeon at Mayo Clinic in Jacksonville, Florida. Dr. Haupt is a former all-American football player and two-time national champion at the University of Florida. As an orthopedic surgery fellow, he gained experience treating Charcot-Marie-Tooth disease. Signs and symptoms of this rare, inherited disease typically appear in adolescence or early adulthood.



Kelechi R. Okoroha, M.D.



Edward T. Haupt, M.D.

“The effects of Charcot-Marie-Tooth disease vary a lot among individuals,” Dr. Haupt says. “There are real nuances that impact treatment.”

COORDINATED APPROACH FOR ALL PATIENTS

Mayo Clinic’s sports medicine practice provides care for recreational, amateur and professional athletes. In addition to including orthopedic surgeons, the treatment team comprises specialists in imaging, physical medicine and rehabilitation and physical therapy.

“We work as a whole to make it as easy as possible for patients to get the coordinated care they need,” Dr. Haupt says.

That coordinated approach extends to individuals with Charcot-Marie-Tooth disease. Genetic testing is used to rule out other neuropathies and to provide information for family planning. To evaluate nerve damage, Mayo Clinic uses nerve conduction studies, electromyography and nerve biopsies. “Great care is required to precisely determine the extent of paralysis,” Dr. Haupt says.

For individuals with severe deformities, corrective surgery can help relieve pain and improve mobility. “The surgeries can take five or six hours,” Dr. Haupt says. “Besides reconstructing the foot, we need to transfer tendons to obtain function in the reconstructed foot.”

Despite that complexity, treatment outcomes are often positive. “Patients with Charcot-Marie-Tooth disease are usually in high school or recently graduated. They’ve had a hard time socially and can’t play any sports. But after surgery, patients often walk without difficulty, don’t need braces and are even able to play golf or use a jump-rope,” Dr. Haupt says. Mayo Clinic’s expertise in telemedicine can facilitate remote initial consultations and follow-up care. “If patients decide after an initial video visit that they want to pursue surgery, they can come to Mayo Clinic for imaging, meet the surgical team and then have surgery. About two weeks later, they can go home and do most of the follow-up remotely,” Dr. Haupt says. “Our system is well suited to providing destination medical center care.”



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Success With Ultrasound-Guided Aspirations of Hip Arthroplasties



Figure. Ultrasound image of hip aspiration shows needle placement (yellow arrows) in relation to labeled parts of a hip prosthetic.

Mayo Clinic uses ultrasound-guided aspiration to determine the presence of prosthetic joint infection (PJI) after total hip arthroplasty (Figure). Orthopedic surgeons apply a technique developed at Mayo Clinic that yields sufficient synovial fluid for culture in most patients, including individuals with high body mass index (BMI).

Aspirations of hip arthroplasties have traditionally been performed in fluoroscopy suites. However, fluoroscopy doesn't show soft tissues and fluids as clearly as does ultrasound. The ultrasound-guided procedure also avoids radiation exposure and provides greater convenience for patients.

"The ultrasound procedure can be easily combined with a patient's visit to the orthopedic clinic because both appointments are in the same location," says Suzanne M. Tanner, M.D., an orthopedic surgeon at Mayo Clinic in Rochester, Minnesota.

PJI is a potentially devastating complication of total hip arthroplasty, leading to complex revision surgery, prolonged antibiotic therapy, morbidity, and the risk of death. Determining the presence of PJI is challenging, as there is no single, accurate test.

At Mayo Clinic, all patients undergoing revision of total hip arthroplasty typically have ultrasound-guided aspiration to check for PJI. "Serum inflammatory markers aren't totally reliable. Around 4% of people with normal inflammatory markers still have an infection," Dr. Tanner

says. "Short of operating to obtain tissue specimens, obtaining fluid specimens for culture is the most important test to determine if a joint is infected."

The major challenge of ultrasound-guided aspiration is obtaining enough synovial fluid for accurate analysis. Mayo Clinic uses a stepwise approach. Initially, the aspiration needle is placed at the neck of the prosthesis. If sufficient fluid isn't obtained, the needle is directed laterally and just past the femoral component neck. Lavage also might be used to draw out fluid.

Another challenge is possibly impaired visualization in patients with high BMIs. Although a high proportion of individuals undergoing ultrasound-guided hip aspirations at Mayo Clinic have BMIs above 30, sufficient fluid is usually obtained, including in patients with BMIs above 40.

As a result, ultrasound-guided aspiration at Mayo Clinic generally provides highly accurate diagnosis of infection. "With a meticulous technique and exacting protocols, we are able to obtain useful fluid with a low contamination rate," says Holly J. Duck, M.D., an orthopedic surgeon at Mayo Clinic's campus in Minnesota. "That success helps our surgical colleagues to determine the best treatment for our patients."

"It's somewhat rare for orthopedic surgeons rather than radiologists to test for PJI," Dr. Tanner says. "At Mayo Clinic, we have a sufficiently large space and patient volume to provide this type of care."



Suzanne M. Tanner, M.D.



Holly J. Duck, M.D.

Education Opportunities

For more information or to register for courses, visit <https://ce.mayo.edu/group/orthopedic-surgery>, call 800-323-2688 or email cme@mayo.edu.

COMPREHENSIVE SHOULDER AND ELBOW COURSE: CURRENT CONCEPTS AND CONTROVERSIES 2022

Feb. 17-19, 2022, in Scottsdale, Ariz.

This expanded three-day course covers the latest treatment options for shoulder and elbow arthroscopy, arthroplasty, and fracture fixation. An internationally recognized faculty will provide key insights and practical tips. The course setting allows personal interaction with the faculty to help participants optimize surgical techniques and avoid complications.

6TH ANNUAL MAYO CLINIC SPORTS MEDICINE FOR THE CLINICIAN 2022

March 4-5, 2022, in Lake Buena Vista, Fla., and Livestream

This course focuses on the diagnosis and treatment of sports-related conditions as well as injuries sustained during recreational physical activities. Appropriate testing and referral criteria will be covered, along with specific skills in physical exams and imaging interpretation.

2022 CONTROVERSIES IN WRIST SURGERY

April 7-10, 2022, in Rochester, Minn., and Livestream

Designed for orthopedic and plastic surgeons with significant hand practices, this course will cover the spectrum of disorders of the wrist and distal radioulnar joint. The format will be case oriented, covering topics such as bony and soft tissue trauma, degenerative disease, and inflammatory arthritis.

MAYO CLINIC COURSE ON SHOULDER TENDON TRANSFER AND COMPLEX ROTATOR CUFF REPAIR 2022

April 28-30, 2022, in Rochester, Minn.

This course provides cutting-edge presentations, cadaver demonstrations and cadaver-based workshops on the management of complex rotator cuff tears and conditions affecting the scapulothoracic joint. The course will highlight the principles, surgical techniques and outcomes of tendon transfers and alternative salvage procedures.

MAYO CLINIC TEACH THE TEACHERS' ELBOW COURSE 2022 — ELBOW INSTABILITY

May 19-21, 2022, in Rochester, Minn., and Livestream

This advanced course is designed for orthopedic surgeons with a special interest in upper extremity trauma, elbow surgery and trauma surgery. The focus is on technical skills.

10TH ANNUAL COMPREHENSIVE SPORTS MEDICINE UPDATE AND BOARD REVIEW

June 22-25, 2022, in Minneapolis, and Livestream

This award-winning course provides a comprehensive review of all subjects in the sports medicine board examination. The faculty includes internationally recognized sports medicine experts.

Contact Us

Mayo Clinic welcomes inquiries and referrals, and a request to a specific physician is not required to refer a patient.

Phoenix/Scottsdale, Arizona
866-629-6362

Jacksonville, Florida
800-634-1417

Rochester, Minnesota
800-533-1564

Resources

[MayoClinic.org/medical-professionals](https://www.mayoclinic.org/medical-professionals)

Clinical trials, CME, Grand Rounds, scientific videos and online referrals

Orthopedic Surgery Update

Mayo Clinic Orthopedic Surgery Update is written for physicians and should be relied upon for medical education purposes only. It does not provide a complete overview of the topics covered and should not replace the independent judgment of a physician about the appropriateness or risks of a procedure for a given patient.

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Cover image:
Skeletal muscle cells, fluorescence light micrograph

Credit: Daniel Schroen, Cell Applications Inc. / Science Photo Library

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