

## Advances in Large Oncologic Sacral Resections



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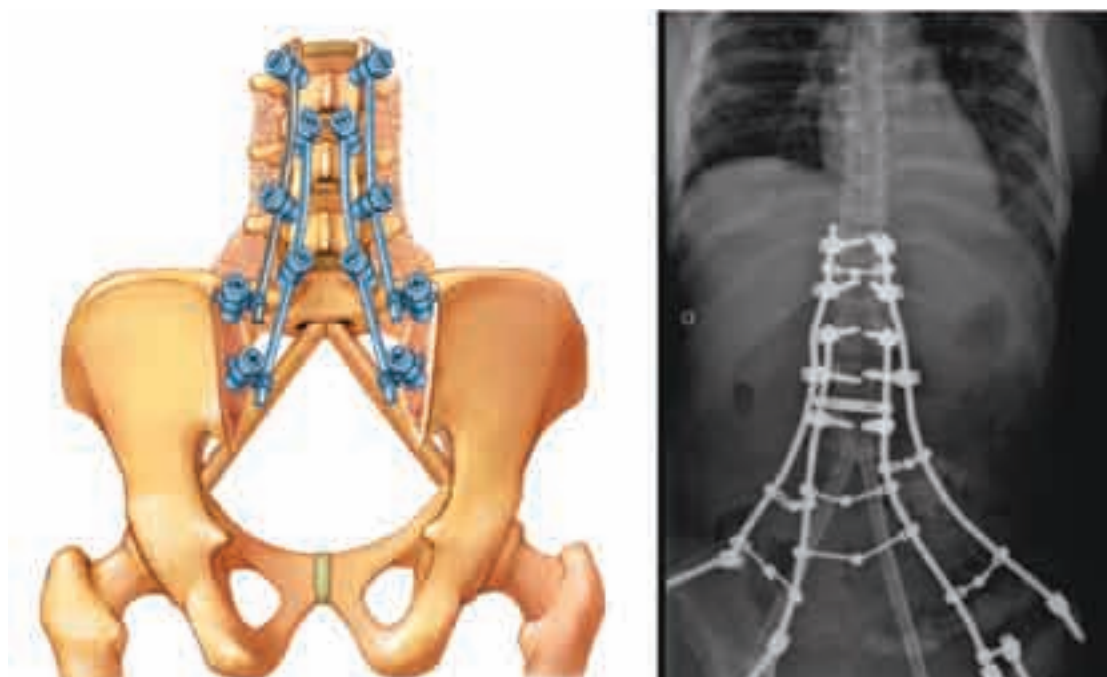
Curative treatment of most primary tumors of the sacrum requires an oncologic sacral resection. This is typically a resource-intensive operation. The surgery involves multiple specialties to manage resections of nerves, bones, and visceral structures. The operating time may extend to 20 hours for the most involved cases, including occasionally disconnecting the spine from the pelvis on one or both sides, then reconstructing the defects.

Few centers perform these demanding surgeries. But because Mayo Clinic's multidisciplinary model is designed to manage surgical complexity, Mayo Clinic in Rochester, Minnesota, averages approximately 20 sacral resections per year and continually seeks opportunities to improve techniques, safety, and outcomes.

### Deploying Specialty Teams

"Considerable resources have to come together to make sacral resection happen safely and successfully. We are fortunate to have both the multidisciplinary depth and the ease of interaction at Mayo to make us one of the few centers in the United States to regularly undertake some of the largest resections," says orthopedic surgeon Peter S. Rose, MD. "The majority of Mayo's sacral resection patients regain a semblance of normal daily living after surgery," Dr Rose says. One resumed waterskiing despite the loss of a leg; another participated in a high school wrestling match.

Adds his orthopedics colleague Franklin H. Sim, MD: "Because all our specialists are on site and practice is integrated, Mayo can field large teams and do it quickly—from mobilizing



**Figure 1.** Mayo Clinic's orthopedic surgeons have devised a classification scheme for sacral resections. It is based on staging and reconstruction protocols involving 43 of the largest resections performed in recent years. Shown here is type I resection total sacrectomy without lumbar excision and bilateral medial iliac excision (n=16).



**Figure 2.** Type II resection hemisacrectomy with medial iliac resection (n=11).



Peter S. Rose, MD

spine and sacral specialists, to multiple related surgical specialties, to anesthesiologists who help patients tolerate long and multiple procedures, to the medical and radiation oncologists, pathologists, and radiologists who help establish the diagnosis, prepare patients for surgery, and plan the operations. Our rehabilitation specialists help patients regain their functional independence as they recover from the procedures.”

**Areas of Advance**

The Mayo team focuses on the following areas of advancing the science of improving sacral resections.

**Classification and Staging**

Mayo’s large volume of procedures has enabled development of a classification scheme for sacral resections. This scheme is based on staging and reconstruction protocols used in 43 resections performed at Mayo in

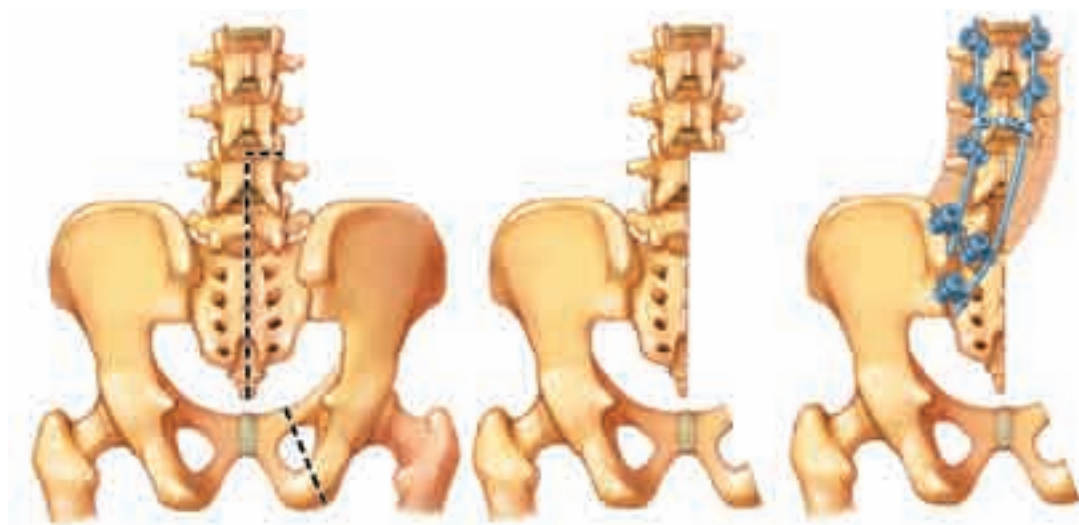
recent years. Type I is total sacrectomy, with or without lumbar excision and bilateral medial iliac excision; type II, hemisacrectomy with medial iliac resection; type III, hemisacrectomy with external hemipelvectomy; and type IV, total sacrectomy with external hemipelvectomy (Figures 1-4).

**Timing**

Here the team looks at potential for improved outcomes and efficiency through the timing of mobilizing various surgical teams such as colorectal, neurologic, and plastic surgeons. Previously, these surgical procedures were performed in a single session. Recently, the Mayo team began staging the resections into shorter surgical sessions as opposed to a single marathon surgery. “This approach tends to be safer for patients and reduces complications and costs because patients spend less time in intensive care,” Dr Rose says.



Franklin H. Sim, MD



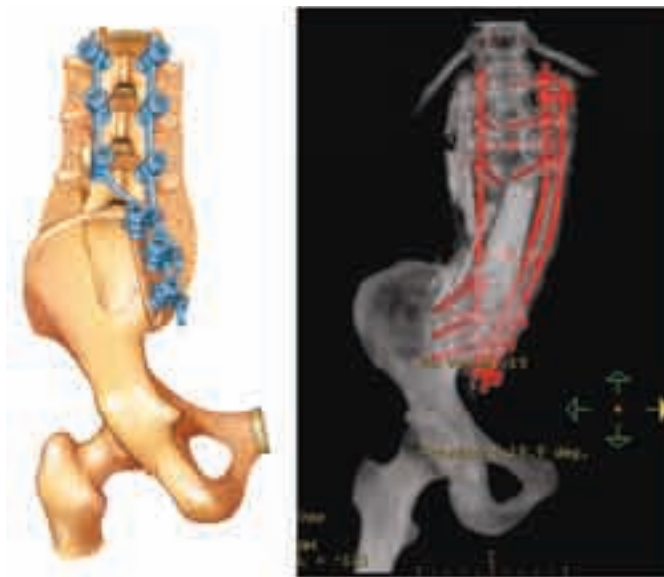
**Figure 3.** Type III hemisacrectomy with external hemipelvectomy (n=12).

### Biomechanics and Cadaver Studies

In the biomechanics laboratory and through cadaveric studies, Michael J. Yaszemski, MD, PhD, has helped direct biomechanical studies to research better ways to restore or reconstruct stable anatomy after large, challenging resections that result in severe loss of structure.

### Conclusion

Although sacral cancers are among the most challenging and pose a high risk of morbidity and mortality from many potential causes, Dr Rose sees encouraging progress from Mayo's teamwork. "By systematically targeting and addressing each area, we believe we can positively impact overall outcomes."



**Figure 4.** Type IV total sacrectomy with external hemipelvectomy (n=4).

## Hip Arthroscopy in an Expanding Patient Group—Young Adults With Femoroacetabular Impingement

Young adults who present with disabling hip pain related to femoroacetabular impingement (FAI) are a rapidly growing cohort of orthopedic patients. Clinical interest in FAI has intensified since 2003 after FAI was identified as a mechanism that could lead to early hip arthritis. As a result of the confluence of these 2 trends, improving early detection and treatment of FAI is a high priority for hip specialists.

In the past, treatment focused on open procedures for restoration of the structural abnormalities around the hip and treatment of labral and cartilage pathology. Now the emphasis is on management of select patients with early FAI—average age about 30 years—through less invasive approaches that include hip arthroscopy. Rafael J. Sierra, MD, is an orthopedic surgeon who specializes in young hip issues in the Division of Adult Reconstruction of the Department of Orthopedic Surgery at Mayo Clinic in Rochester, Minnesota. He explains: "While we still use hip arthroscopy for typical problems around the hip such as removing

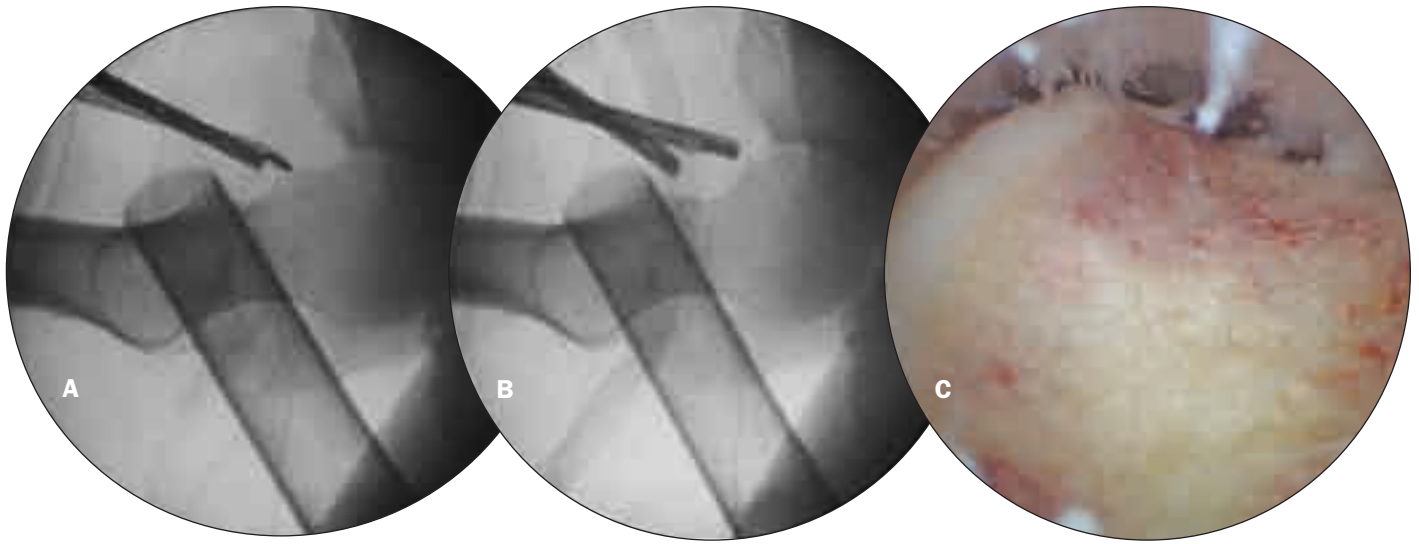


*Treating young hip patients are Mark W. Pagnano, MD, Rafael J. Sierra, MD, Bruce A. Levy, MD, and Joseph J. Eischen, PT.*

loose bodies and repairing traumatic labral tears, our practice is changing. Over the past 3 years, practice has been shifting toward treatment of the hip with FAI."

### Rise in Hip Arthroscopy

More than 30,000 hip arthroscopies were performed in the United States in 2008. That number is expected to increase consistently at an average annual growth rate of more than 15%, thus exceeding 70,000 procedures by 2013. Notes Bruce A. Levy, MD, sports medicine and arthroscopy specialist and Dr Sierra's colleague



**Figure.** The presence of structural abnormality, such as this cam lesion, can be treated by either an open or an arthroscopic technique. A, Fluoroscopic image of the cam lesion being resected; B, postresection view; and C, arthroscopic view.

## Future Watch: Screening Teens for FAI, Conducting Clinical Trials

To advance care of FAI, 2 initiatives are under way at Mayo Clinic:

- FAI screen.** It is unclear who is predisposed to FAI and when onset occurs. An FAI screening program aimed at detecting patients at risk may help answer these questions. Performed as part of a teen's preparticipation sports physical, the prototype identifies teens with hip stiffness and limitation of motion. X-rays and MRIs reveal tissue and bone defects. The screen has the potential to provide much-needed information about the natural history of FAI and to affect youths' lives by detecting potentially damaging changes in the hip early, just as did screening for scoliosis.
- Randomized clinical trial.** One weakness in FAI surgical decision making is the lack of comparative outcome data on arthroscopic vs open techniques. Long-term follow-up data for open surgery are available, but only 1 or 2 years of outcome data have been published for arthroscopic procedures. Mayo is filling the data gap by designing a randomized clinical trial comparing the 2 techniques.

in young hip cases: "Although hip arthroscopy has been performed for well over 15 years, it has now hit the forefront of orthopedic practice because of the recognition of FAI and the fact that some cases of FAI can be treated with hip arthroscopy. The enthusiasm for hip arthroscopy itself is aided by the rapid development of hip-specific arthroscopic instrumentation."

In experienced hands, select cases of FAI can be successfully treated by hip arthroscopy. "Even so, our group works as a team to take a well-considered approach to hip arthroscopy," Dr Levy says. "And because of our extensive experience treating young hip disorders, we recognize the open procedure still plays an important role."

### Multidisciplinary Team Expands Expertise

Mayo surgeons team with sports medicine rehabilitation experts early—before FAI surgery. The team credits this

early, synergistic melding of specialties—adult reconstructive surgery, arthroscopy, and sports medicine physical therapy—with its high success rates.

In this team model, surgeons have the capacity to perform a full open procedure, a full arthroscopy, or a combined arthroscopy and mini-open technique, as conditions indicate. Therapists can individualize a rehab plan before the surgery, thus optimizing chances for immediate compliance. Notes Joseph J. Eischen, a physical therapist in the Sports Medicine Center: "By seeing patients before their surgery, I can motivate them to comply immediately after surgery with a stepwise program that is specifically designed to their condition and their surgery. It's a really good system that really helps patients."

### Choosing a Technique

To choose a technique, the team discusses all aspects of the physical examination findings, patient symptoms, and radiographic criteria. They pay special attention to the main components of FAI that determine approach: labral pathology and bony abnormalities, including whether acetabular version and normal femoral head sphericity are normal.

Explains Dr Levy: "A patient with a large structural abnormality of the hip joint is typically treated with an open technique. If there are structural abnormalities that we believe can be corrected safely arthroscopically, then we proceed, as shown in the Figure. Safety must always guide selection of technique."

## Selected Highlights

### Strength Training Superior to Endurance Training for Nonoperative Rehabilitation of Distal Biceps Tendon Rupture

Surgical repair is the treatment of choice for rupture of the distal biceps tendon, but it is not always possible because of lack of surgical expertise, presence of complicating medical issues and comorbid conditions, or patient preference. The use of nonsurgical management has been limited by conflicts in the literature on the biomechanical consequences of rupture and repair. A new Mayo Clinic study published in the *Journal of Shoulder and Elbow Surgery* (Nesterenko et al, 2010;19(2):184-9) sought to clarify this by determining patients' flexion and supination strength and endurance. It is the first study to emphasize endurance rather than single-event strength.

Isokinetic strength and endurance were measured in elbow flexion and forearm supination in both arms in 10 men who had a unilateral, complete distal biceps tendon rupture that had remained untreated for at least 2 weeks. Investigators reached conclusions that differ from generally accepted practice. Data suggest that patients may respond best biomechanically to a rehabilitation program that emphasizes improvements in strength over endurance.

### The Importance of Dental Hygiene for Infection Control in Total Joint Replacement Patients

The potential for prosthetic hip and knee joint-associated infections (PJI) related to dental procedures is a longstanding concern of orthopedic surgeons. A new Mayo Clinic-led study in *Clinical Infectious Diseases* (Berbari et al, 2010;50(6):8-15; erratum: 2010;50(6):944) is the first large-sample, case-control study to define the risk of PJI related to dental procedures.

Data from the prospective, single-center study of 339 patients and 339 controls suggest that antibiotic prophylaxis may not be needed routinely for every patient with total joint replacement before they undergo dental procedures. Encouraging patients to practice meticulous dental hygiene helps minimize the risk of infection.



To learn more about Mayo Clinic's ongoing orthopedic research, visit [mayoresearch.mayo.edu/mayo/research/ortho/index.cfm](http://mayoresearch.mayo.edu/mayo/research/ortho/index.cfm)

## Enhancing Value in Spine Care



Bradford L. Currier, MD



Paul M. Huddleston III, MD

As a founding member of both the Council for Value in Spinal Care and the North American Spine Society's Value Task Force, Mayo Clinic orthopedic surgeon Bradford L. Currier, MD, is committed to creating value in health care. As he sees it, the Division of Orthopedic Spine Surgery at Mayo Clinic in Rochester, Minnesota, is following 3 new paths that are especially promising for helping maximize value for patients.

### Advanced Multidimensional Technology

The creation in 2009 of large, state-of-the-art spine operating rooms at Saint Marys Hospital (Figure 1) makes it easier for large multidisciplinary teams of specialists to interact and to take advantage of technological advances. In particular, a new surgical navigation system and new intraoperative CT technology (Figure 2) enable precise understanding of the anatomy in 3 dimensions with minimal access. Instrumentation can be placed and its location verified precisely.

"This technology is an exciting addition to our surgical armamentarium. Monitors linked to the surgical navigation system, cameras, and the operating microscope allow everyone to see what's going on at all times," Dr Currier says. "This technology benefits patients undergo-

ing minimally invasive surgery, but it has also proven useful for resecting tumors and creating complex osteotomies in deformity cases." In addition to improved visualization, the new technology may promote faster recovery and shorter operating times because smaller incisions are needed.

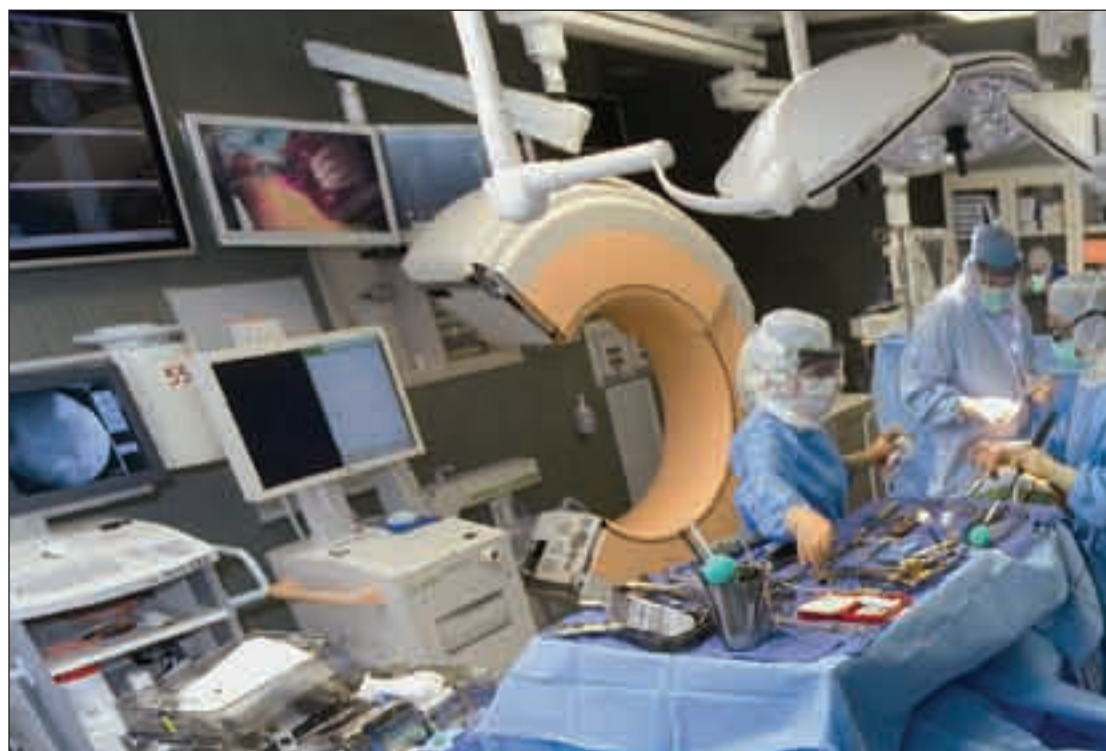
### Joint Registry Resources

Mayo Clinic's extensive total joint registry resources are being well leveraged to collect patient-reported outcome data. Mayo will use the data at the point of care to help understand the level of disability caused by the patient's condition and to objectively monitor responses to treatment. The data can also be used to assess the value—including cost-effectiveness—of various interventions in populations of patients.

Says orthopedic surgeon Paul M. Huddleston III, MD, who leads the registry effort for the Division of Orthopedic Spine Surgery: "From a societal perspective, we need to rigorously assess the value of our care using methods that allow us to compare orthopedic interventions with those of other disciplines."

### Point-of-Care Patient Education

Data show that robust patient education

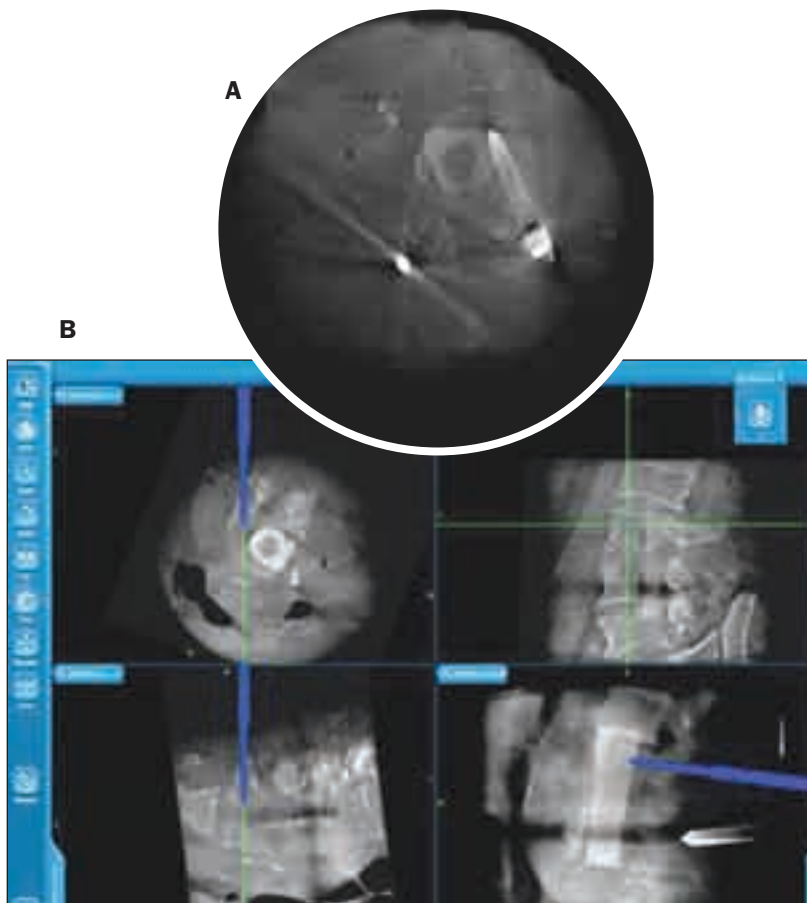


**Figure 1.** One of Mayo Clinic's new spine surgical suites at Saint Marys Hospital accommodates multidisciplinary teams and supports advanced technology such as intraoperative CT and a surgical navigation system.

improves patient satisfaction. A new Mayo initiative involves extending that finding beyond patient attitudes to treatment outcomes. Barbara K. Hanna, project manager for technology with Mayo Patient Education, is collaborating with the Department of Orthopedic Surgery on the project. "We believe we can improve outcomes by taking a new approach to patient education," she says. "Our research has found patient behavior does change with point-of-care instructional videos."

In the new approach, customized high-security software installed on the physician's consult room computer converts it into a secure information kiosk. The kiosk delivers to the patient educational information tailored to his or her condition.

"A better informed patient can participate in shared decision making and become a partner rather than a passive recipient of care," Dr Currier says. "We believe there is real value in leveraging new technology to improve patient understanding, safety, and outcomes in a cost-effective manner."



**Figure 2.** A, Axial image of screw next to the femoral graft at L3 obtained with the help of a new image-guided navigation system. B, Screen shot of the surgical navigation system. Together the navigation system and intraoperative CT technology enable precise understanding of the anatomy in 3 dimensions with minimal access.

## Mayo Clinic Leadership

### A Broader Reach and Tighter Grasp: Leadership in Hand and Wrist

Mayo Clinic orthopedic surgeon William P. Cooney III, MD, is known worldwide for landmark contributions to treatment of congenital hand and upper extremity disorders, injuries, and arthroplasty of the hand, wrist, and elbow. As a pioneer in developing hand and wrist joint prosthetic implants, he recently captured years of innovative collaborations in the Division of Hand Surgery of the Department of Orthopedic Surgery at Mayo Clinic in Rochester, Minnesota, in a new book: *The Wrist: Diagnosis and Operative Treatment*.

Dr Cooney's leadership as 2009 board chair for the Orthopaedic Research and Education Foundation (OREF) is the most recent extension of his creative service ethic. OREF raised nearly \$20 million for orthopedic research and education in 2009, funding 171 different grants and awards.

Says Dr Cooney: "My clinical and research practice has been so gratifying, largely because of the improvements brought to patients' lives. I see the possibilities for that kind of patient-centered work rapidly expanding under OREF through its aggressive development of fellowships and partnerships that create meaningful opportunities."



William P. Cooney III, MD

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## CME Opportunities

### Diagnostic and Interventional Musculoskeletal Ultrasound

July 15-17, 2010, Rochester, MN

The techniques and applications of diagnostic and interventional musculoskeletal ultrasound in the major joint regions of the body are the focus of this comprehensive course in which participants each complete over 13 hours of hands-on training. This includes needle tracking skills, ultrasound machine controls, scanning on live models, and performing ultrasound-guided procedures on fresh cadaver specimens. All skill levels will be accommodated.

For information or to register, contact 800-638-5352 or [bkinney@aium.org](mailto:bkinney@aium.org).

### Mayo Clinic Orthopedic Alumni and 100th Anniversary Symposium

September 16-18, 2010, Rochester, MN

Mayo Clinic Department of Orthopedic Surgery annually offers Mayo-trained surgeons professional enrichment on state-of-the-practice in surgical and nonsurgical management of orthopedic injuries and conditions. In honor of its 100th anniversary this year, the Department of Orthopedic Surgery is enhancing clinical updates with historical perspectives on its continued impact on global practice.

For information or to register, contact 800-323-2688 or [cme@mayo.edu](mailto:cme@mayo.edu).

### 20th Annual Mayo Clinic Symposium on Sports Medicine

November 12-13, 2010, Rochester, MN

Through a case-oriented approach, world-class faculty will present the latest principles for the integrated care of the injured athlete. Video demonstrations, lectures, and dynamic discussions will address many major sports-medicine clinical conditions and training issues pertinent to all sports-medicine physicians and professional trainers.

For information or to register, contact 800-323-2688 or [cme@mayo.edu](mailto:cme@mayo.edu).

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