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Patellofemoral Arthroplasty in Arthritis Patients

For more than a decade, good to excellent results have been obtained in patellofemoral arthritis patients who have undergone total knee arthroplasty (TKA) to relieve debilitating pain and impaired mobility. Still, there is controversy over the optimal surgical management of these patients. The central question persists:

Is TKA more than is needed to restore pain-free mobility—especially in young, active patients?

A New Approach

“The vast majority of patellofemoral pain and early patellofemoral arthritis can and should be treated nonoperatively,” explains

Mayo Clinic Sports Medicine Center orthopedic surgeon Diane L. Dahm, MD. But cautious consideration of a new approach, patellofemoral arthroplasty (PFA), may be indicated in carefully selected refractory cases of advanced degenerative disease confined to the patellofemoral articulation (Figure 1).

“Patients with patellofemoral arthritis may not have disease in all three knee compartments,” Dr Dahm says. “This finding has led a few centers—Mayo Clinic among them—to adapt partial knee arthroplasty approaches more commonly used in lateral and medial compartment procedures to cases involving only the patellofemoral articulation. Although our study of the technique is

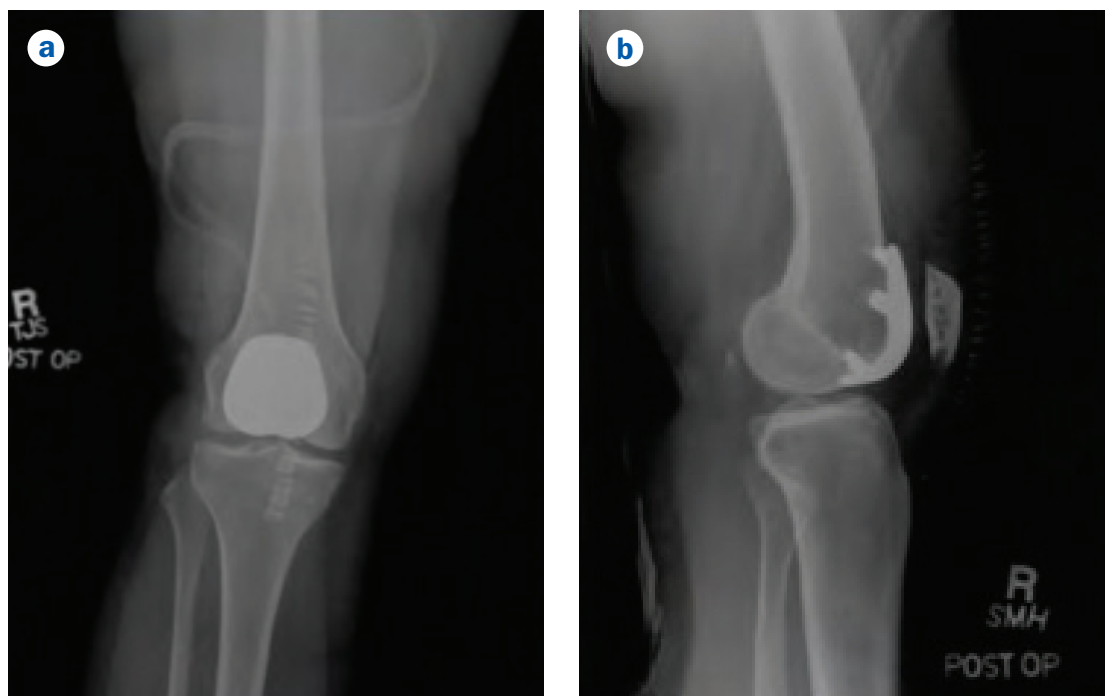


Figure 1. Post-operative radiographs of (a) anterior-posterior and (b) lateral views of patellofemoral arthroplasty.

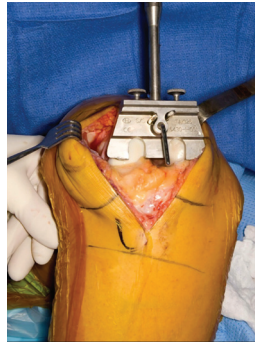


Figure 2A. PFA technique involves an anterior femoral cut to initiate the procedure, as seen here.

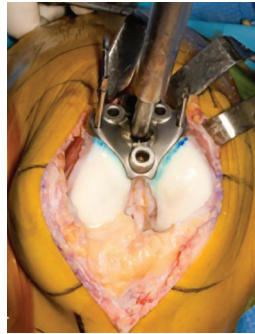


Figure 2B. The trochlea is prepared.



Figure 2C. The patella is prepared.

ongoing, we have performed more than 100 procedures and are encouraged by our early results.” Adds her colleague Bruce A. Levy, MD, Mayo Clinic orthopedic surgeon: “Selecting the appropriate patient (see sidebar) is paramount to achieving the goal of excellent outcomes associated with TKA, but through a less invasive surgical procedure (Figure 2).”

Benefits and Risks

Compared to TKA, partial, or unicompartmental, arthroplasty management of isolated patellofemoral disease offers potential benefits of:

- sparing the remaining healthy knee compartments and associated structures
- inflicting less surgical trauma and blood loss
- minimizing risk of complications
- reducing hospital stay
- supporting an easier overall recovery and return to lifestyle
- possibly serving as a bridging treatment for active younger patients who may one day be candidates for TKA

Risks include mid- to long-term failure as a result of tibiofemoral degeneration, which has been reported to occur in up to 25% of patients and is the subject of a new Mayo Clinic study (Sidebar, p. 3).

Identifying the Ideal Patient for PFA

Patient selection is central to the success of treating patellofemoral arthritis with the partial procedure. Patellofemoral pain is multifactorial and complex in terms of symptomatology, and patients may be motivated by their discomfort and disability to assume the solution is surgical. But it is imperative to exhaust all nonoperative measures first. Surgery is not indicated for mild cases that upon radiographic, MRI or arthroscopic exam lack severe degeneration of the patellofemoral articulation.

In addition to fulfilling indication criteria (Table 1), the ideal patient also has the following features:

- Minimal pain while walking on level surfaces
- Isolated anterior retropatellar pain that is exacerbated by:
 - Standing from seated position
 - Climbing up/down stairs
 - Walking on uneven surfaces
 - Sitting long periods with knee flexed

Table 1.

Indications	Contraindications
Advanced, isolated primary PF arthritis	Moderate or advanced tibiofemoral chondromalacia
Patellofemoral arthritis with trochlear dysplasia, often with a history of instability	Severe malalignment/maltracking
Post-traumatic PF arthritis	Inflammatory arthritis Morbid obesity Patella baja

Risk of PFA Failure Due to Tibiofemoral Osteoarthritis

Absence of pre-operative trochlear dysplasia in patellofemoral arthroplasty (PFA) patients should be considered a risk factor for early progression of tibiofemoral osteoarthritis. This is the conclusion of a new study by Mayo Clinic Department of Orthopedic Surgery of failed PFA cases. Tibiofemoral osteoarthritis is a complication reported in up to 25% of PFA patients. Study results were presented at the May meeting of the European Society of Sports Traumatology Knee Surgery and Arthroscopy in Switzerland.

The researchers reviewed pre- and post-operative data on 59 of the 61 available PFA patients' cases performed by 1 surgeon at a single institution with the same type of implant between 2003 and 2009. Researchers reviewed range of motion, function and radiographic evidence in order to determine factors that were most likely to influence outcomes.

Results showed that patients who had pre-operative radiographic evidence of trochlear dysplasia experienced less progression of tibiofemoral osteoarthritis compared to patients without trochlear dysplasia at final follow-up.



Diane L. Dahm, MD



Bruce A. Levy, MD

Improved Technology and Technique

Advances in patellofemoral prosthesis design, biomechanical understanding and surgical technique combine to improve the likelihood of successful outcomes. Preliminary results with the most recent generation of patellofemoral implants suggest that the patellofemoral arthroplasty (PFA) procedure has improved significantly—with 80% to 95% satisfactory results reported in the literature. Recent literature reports that at 5 years follow-up, 96% of implants are still performing successfully. “The reported results of PFA using first-generation implants have been suboptimal,” Dr Dahm says. “But the newest technology, coupled with the evolution of surgical technique, makes this a promising option for certain patients.”

Partial vs Total

To test the potential benefits of the improved implant design and surgical technique, Dr Dahm and her Mayo colleagues compared 23 PFA patients to 22 TKA patients in an investigation reported in the *American Journal of Orthopedics*. With a mean age of 60 in the PFA group and 69 in the TKA group, and

minimum follow-up of 24 months on both groups, results showed comparable knee outcome scores between the two groups.

Notes Dr Dahm: “We found similar outcomes with respect to pain resolution, but the function and activity levels were better in the patellofemoral arthroplasty group, along with a trend toward improved range of motion and lower complication rate. Given these strong early data, our conclusion is that PFA may be the better choice in certain patients because it is less invasive.”

As postoperative X-rays indicate, careful technique results in a stable knee with improved patellar tracking that provides the patient with pain relief and restored mobility.

Dr Dahm notes that comprehensive aftercare with physical and occupational therapy is vital to the positive outcomes Mayo has been achieving with PFA: “Both before and after surgery, we’ve found that recovery is well supported by the integration of physical therapy at our Musculoskeletal Center. By treating patients with a multidisciplinary team from the very beginning, patients have the best chance for regaining strength, stability and a return to pain-free mobility.”

Mayo Clinic Orthopedic Contributions



Daniel J. Berry, MD



Michael J. Stuart, MD

As the annual meeting of the American Association of Orthopaedic Surgeons (AAOS) convened in February in San Francisco, Mayo Clinic Department of Orthopedics offered unusually strong contributions in terms of leadership, organization and expert panelists. More than 30 Mayo staff physicians played key roles in the event or individual sessions.

These include Mayo Clinic Orthopedic Department Chair Daniel J. Berry, MD, who began the event as the 79th president of AAOS and is now past president, succeeded by John Tongue, MD, of Lake Oswego, OR. Mayo Clinic's Michael J. Stuart, MD, served as annual meeting program chair. Mayo's Mark W. Pagnano, MD, served as instructional course committee chair, and David G. Lewallen, MD, represented Mayo Clinic Orthopedics as head of the American Joint Replacement Registry (AJRR), which Dr Berry highlighted in his address as a key quality initiative of AAOS.

Gains Made in 2012

Reflecting on his year as AAOS president, Dr Berry emphasized the organization's strength and unity, and the culture of quality that such

a dedicated membership creates. In addition to the AJRR, other key quality AAOS achievements he lauded include:

- promoting evidence-based practice
- creation of the Orthopaedic Quality Institute and its work with comparative effectiveness data
- providing top-notch and reliable education for AAOS members, including advances in mobile applications, 3-D video, Internet 2.0, surgical simulation and easy access to journals through the single-site portal, OrthoPortal.

AAOS Chief Executive Officer Karen Hackett, FACHE, CAE, concurred with this assessment of the organization's progress on quality initiatives made in 2012. She credits Dr Berry with helping motivate members to give of their time and talents. "Over the past year, we've made great strides, in large part due to the collegial response Dr Berry prioritizes and practices," she said.

Joint Replacement Registry

With data reported from 19,000 total-joint arthroplasty (TJA) procedures, the American

American Joint Replacement Registry Milestones

begun in 2009, the American Joint Replacement Registry has made swift and steady progress toward building a large database to help improve patient care.

2009

The American Joint Replacement Registry (AJRR) received conceptual and financial support from the Academy of Orthopaedic Surgeons (AAOS) and industry leaders. It incorporated as a not-for-profit organization, received independent institutional review board approval and completed enabling paperwork. By September, work groups formed.

2010

The AAOS ratified the first board of AJRR. Leadership finalized and approved business plans. The AJRR received 501(c) (3) status.

2011

A pilot program began, recruiting 15 diverse hospital sites. Data collection and transmission proceeded. In July, pilot results were reviewed and improvements designed.

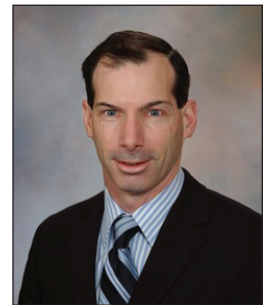
to AAOS 2012 Annual Meeting

Total Joint Replacement At A Glance

- Each year in the US more than 750,000 knee and hip replacements are performed—and as many as 12% may require future revision.
- Registries can help reduce the revision rate. Data from joint registries in Sweden, the United Kingdom, Canada and Australia show up to 5% reduction in revisions after the initiation of a total joint replacement registry.
- Even a 2% reduction in the US revision rate would improve patient quality of life and realize substantial savings –more than \$65 million.



David G. Lewallen, MD



Mark W. Pagnano, MD

Joint Replacement Registry (AJRR) is steadily expanding, according to Dr Lewallen.

Ultimately, the registry will serve as a national “trip wire” for issues with implants, Dr Lewallen said.

Registries are important means of examining the effectiveness of orthopedic implants in terms of improving patient safety and functional outcomes, enhancing quality of

care and reducing costs (Figure 1).

Mayo Clinic’s own registry experience has been strongly positive. Begun in 1969, the Mayo Clinic Total Joint Registry (MCTJR) is unique in the world due to the length of time it has been in operation, the level of detailed follow-up it provides and its large enrollment. Currently more than 41,000 joint replacement procedures are maintained in the MCTJR.

2012

As of February, 80 hospitals enrolled, with a year-end goal of enrolling 150 additional hospitals.

2013

Recruitment to continue. Plans call for 800 new participants this year.

2014

Plans call for recruiting another 1,000 hospitals into the AJRR.

Mayo's Franklin Sim Honored for Advancing Diversity in Orthopedics

The American Academy of Orthopaedic Surgeons (AAOS) has presented its annual Diversity Award to Franklin Sim, MD, chair of the division of musculoskeletal oncology at Mayo Clinic Rochester and professor of orthopedic surgery at the Mayo Clinic College of Medicine.

"Diversity is all the differences in all of us, not just gender, cultural traditions and race," Dr Sim said at an award ceremony during the academy's annual meeting in San Francisco in February. "When we embrace diversity, it makes us stronger and richer."

Dr Sim has mentored nearly 500 young physicians, including many women who are leaders in the field. He has also regularly hosted visiting orthopedic surgeons, residents and fellows from countries where orthopedic surgery continues to evolve.

"Dr Sim embodies what diversity means," said Sharonne N. Hayes, MD, Mayo's director of diversity. "He's a champion for training women and minorities and people from all over the world to care for all types of patients."

Sim was nominated for the award by his colleague Michael Yaszemski, MD, PhD. "Frank has taught me to constantly work to do things better for the patients ... and to never think that we've arrived," Yaszemski said.

A native of New Glasgow, Nova Scotia, Dr Sim said he had to decide as a young man between a career in professional hockey and one in medicine. He chose medicine, receiving his medical training at Dalhousie University in Halifax, Nova Scotia, before completing residencies in internal medicine and orthopedic surgery at Mayo Clinic.

Tumor surgery is his primary interest. "The rewards from treating these challenging cases, and the satisfaction of improving outcomes by working collaboratively with my incredible colleagues, both at Mayo and throughout AAOS, are what motivate me. It is truly a privilege to work and practice among you."



Franklin H. Sim, MD



Sharonne N. Hayes, MD

For over 100 years, Mayo Clinic Department of Orthopedic Surgery has been committed to conducting research as a means of improving patient outcomes and advancing science. In the first quarter of 2012, Mayo Clinic orthopedic specialists published more than 50 research articles in peer-reviewed journals. We offer two highlights below.

Slipped Capital Femoral Epiphysis

Larson AN, Sierra RJ, Yu EM, Trousdale RT, Stans AA. Outcomes of Slipped Capital Femoral Epiphysis Treated With In Situ Pinning. Journal of Pediatric Orthopaedics. March 2012;32(2):125-130.

Mayo Clinic orthopedic researchers conclude that robust prospective studies are needed to help readily identify which slipped capital femoral epiphysis (SCFE) patients can be managed successfully by in situ pinning, and which need early deformity correction to prevent complications later in life.

Their new study reports performance outcomes from 176 hips treated at Mayo Clinic from 1965 to 2005. SCFE is most frequently seen in patients ages 10-16, with males predominating. Typical SCFE treatment calls for in situ pinning. Reduction of the slip to correct deformity is generally not attempted.

The study was prompted by growing concern that absence of slip reduction leaves the epiphysis in a nonanatomic position, placing

patients at risk of developing degenerative joint disease due to abnormal joint kinematics and femoroacetabular impingement. Prior to this study, available outcome data of in situ pinning for SCFE were not adequate to assess this risk and the need for subsequent reconstruction.

Results of patients treated by in situ pinning showed:

- 33% had residual pain
- 10% at 10 years underwent reconstructive surgery
- 5% at 20 years were likely to develop arthritis so severe that total hip arthroplasty was warranted

Carpal Tunnel Syndrome

van Doesburg MHM, van der Molen AM, Henderson J, Cha SS, An KN, Amadio PC. Sonographic Measurements of Subsynovial Connective Tissue Thickness in Patients with Carpal Tunnel Syndrome. Journal of Ultrasound Medicine. January 2012;31:31-36.

In an international collaborative study that compared healthy tissue to that of carpal tunnel patients, Mayo Clinic Orthopedics Department biomechanics researchers have shown that it is possible to measure subsynovial connective tissue thickness using sonography.

Their results reveal thicker tissue in patients who have carpal tunnel syndrome. This information may one day be helpful in developing noninvasive methods to assess carpal tunnel biomechanics and subsynovial connective tissue material properties. It may also be useful as a diagnostic and prognostic aid in the management of patients with carpal tunnel syndrome, a common and often disabling disorder.

The team made longitudinal sonograms of the middle finger superficial flexor tendon and subsynovial connective tissue at 3 levels: the proximal tunnel (wrist crease), mid tunnel

(hook of the hamate), and at the distal tunnel (distal edge of the transverse carpal ligament). By measuring thicknesses at every level of the subsynovial connective tissue perpendicular to the direction of the tendon and the diameter of the flexor digitorum superficialis tendon within the same level, they created a thickness ratio.

Results of the investigation showed:

- At all 3 levels, the subsynovial connective tissue was thicker in patients than in controls ($P < .0001$).
- Thickness ranged from 0.60 to 0.63 mm in patients and from 0.46 to 0.50 mm in controls.
- The thickness ratio varied by level. It was significantly greater in patients at the hamate and distal levels ($P = .018$ and $.013$, respectively).

Mayo Clinic Orthopedic Update

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CME Opportunities

Musculoskeletal Ultrasound in the Lower Limb

July 19-21
Rochester, MN

The Mayo Clinic, in collaboration with the American Institute for Ultrasound in Medicine, is offering a 3-day course in using musculoskeletal ultrasound for lower-limb diagnosis and intervention. The course is appropriate for physicians, sonographers, podiatrists, and others who evaluate and treat patients with lower-limb disorders. Faculty will demonstrate examination protocols, pathologies and ultrasound-guided procedures for the hip, knee and ankle. Lectures will be supplemented by live demonstrations as well as hands-on experience scanning live models and performing sonographically guided procedures on unembalmed cadavers. This course is designed to meet the needs of learners at the beginner as well as intermediate/advanced levels.

To register, go to www.aium.org. For questions, contact Danielle Delanko at ddelanko@aium.org or 800-638-5352.

Knee Dislocation and Multiligament Knee Reconstruction

Sept. 20-21
Rochester, MN

This 2-day surgical skills course is designed to enhance understanding of the surgical management of the dislocated knee. This course will aid the learner in understanding the need for thorough vascular assessment, timing of surgery and current treatment strategies. Designed for all orthopedic surgeons involved in caring for the acutely injured patient and for those interested in multiligament knee reconstruction.

For information, contact cme@mayo.edu or 800-323-2688.

22nd Annual Mayo Clinic Symposium on Sports Medicine

Nov. 9-10
Rochester, MN

Providing an integrated approach to the injured athlete, this is a 2-day, case-oriented program. Case presentations, lectures and video demonstrations are designed to be of broad interest and practical application to all sports medicine practitioners as well as athletic trainers.

For information, contact cme@mayo.edu or 800-323-2688.

To view all Mayo Clinic CME offerings visit www.mayo.edu/cme/



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