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Hip-Spine Syndrome: A Vexing Clinical Entity

Introduction

Hip-Spine Syndrome (HiSS), characterized by simultaneous degenerative hip arthritis and lumbar stenosis, represents a condition that is becoming increasingly prevalent as our community ages.[1] First identified in 1983 as a difficult condition to diagnose and treat, the correct source of disability was deemed critical to avoid misattributed treatment.[2,3] Variations in HiSS are classified in four general categories: simple, complex, secondary, and misdiagnosed. Simple has a clear primary source of symptoms, while complex lacks a definitive primary source. Secondary has both hip and spine pathologies present with interrelated effects of each pathology contributing to the other. Finally, those individuals with misdiagnosed received poorly suited treatment secondary to a misattributed primary pathology.[2,4,5]

Pain from the lumbar spine, pelvic girdle, and hip overlap as coordinate motion throughout these regions is interrelated. This may present with a structural, kinetic, or physiologic disorder in combined variation. This complex pathology makes for challenging clinical decisions as to which procedures and in what order will provide the greatest benefit.[5] Determining the diagnosis, symptom etiology, and correct treatment remains difficult in the management of HiSS.

Epidemiology

Although the precise prevalence of coexistent hip and lumbar spine pathologies is unknown, degenerative hip and lumbar pathologies are exceedingly common. In adults over the age of 60, 19% to 47% are estimated to have spinal stenosis,[6] and the prevalence of axial spondyloarthrosis and ankylosing spondylitis are estimated to both be 0.35%.[7] The hip is among the most common joints to be affected by osteoarthritis (OA) due to its high axial weight-bearing responsibility. Radiographic evidence of hip OA is 27% in patients 45 years of age and older, and the rate of symptomatic hip OA is 9%.[8,9]

(Continued on Page 2)

Hip-Spine Syndrome *(Continued from Page 1)*

A Diagnostic Conundrum: Differentiating Hip and Spine Pathologies

Patients with either hip or spine pathologies can have referred pain to the low back, gluteal, groin, thigh, and knee as the femoral, sciatic, and obturator nerves course from the lumbar spine through the greater hip area. Several diagnostic tools can help discern a primary hip or spine pathology.

History

Patients with groin pain are seven times more likely to have symptomatic hip pathology regardless of presence of spine disease.[10] Pain described as aching, especially when reproduced upon weight bearing, suggests mechanical OA-related pain from the hip. Alternatively, pain described as tingling, shock-like, or burning is more consistent with radiculopathy and is suggestive of lumbar pathology when accompanied by cutaneous sensory impairment in a dermatomal pattern.[4]

Physical Exam

Tests Suggesting a Primary Hip Pathology

Gait observation can strongly inform the differential diagnosis. Antalgic gait, with a shortened stance phase, suggests mechanical pelvic pain secondary to hip degeneration.[11] Trendelenburg gait can be seen with either hip or spine pathology. With hip pathology this is due to abductor weakness and pain; with spine pathology this is due to L4-S1 myotome weakness. A limp, limited internal rotation or pain at the end of internal rotation suggests a primary hip pathology with or without a coexisting spine pathology.[10] Groin pain is more associated with primary hip pathology.

Tests Suggesting a Primary Spine Pathology

Physical exam findings are less sensitive for lumbar pathologies as they present with widely varying symptoms. Sensory, motor, and reflex deficiencies may be present in patients with lumbar radiculopathies, which can localize the affected nerve root (Table 1). Although a femoral tension sign is less than 20% sensitive to lumbar stenosis, a positive finding is five times more likely to be found in patients with lumbar stenosis than with an isolated hip pathology and indicates upper lumbar radiculopathy.[10,12] A positive straight leg or contralateral straight leg is also consistent with a lower lumbar radiculopathy. Pain on extension in a forward bend test is consistent with lumbar stenosis or instability, and reproduction of pain on direct palpation of the lumbar vertebral column suggests a spine pathology.

Table 1. Lumbosacral Nerve Roots With Associated Myotomes and Dermatomes

Nerve Root	Motor	Sensory
L1		Upper anterior thigh
L2	Hip flexors (T12-L3)	Anteromedial thigh
L3	Quadriceps / Hip Adductor (L2-L4)	Anteromedial thigh
L4	Tibialis anterior	Medial leg, medial foot
L5	Extensor hallucis longus	Lateral leg, dorsum of foot
S1	Peroneus longus and brevis, plantar flexors	Posterolateral leg, lateral border / plantar surface of foot

Imaging and Injections

Local injections are often used to confirm symptom etiology in patients with HiSS after obtaining radiographic evidence of pathology. However, imaging should be correlated to physical exam findings since many patients with radiographic evidence of degeneration are asymptomatic.

Hip

Standard standing AP pelvis, cross-table lateral, and frog-leg radiographs can be used to evaluate the hip joint (e.g., Figure 1). CTs and AP radiographs can be used to assess alignment and positioning of either the native hip or arthroplasty components, including acetabular anteversion and inclination, femoral version and inclination, femoral offset, and leg-length discrepancy. Pain relief upon fluoroscopically guided hip injection in patients with radiographic OA suggests primary hip pathology, and incomplete or no pain relief suggests a lumbar pathology.[1] Pain relief upon intra-articular bupivacaine injection was found to be 87% sensitive and 100% specific to a primary hip pathology.[13]

Spine

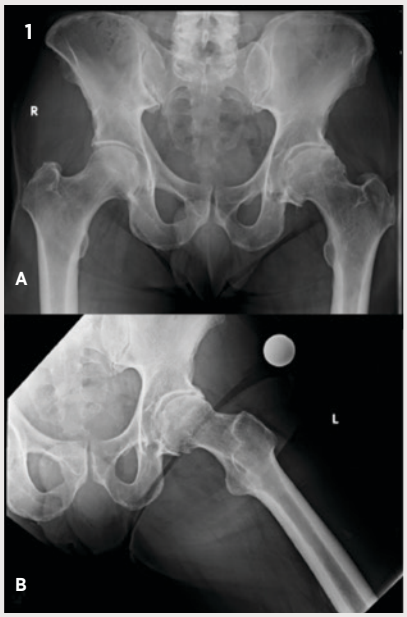
AP and lateral flexion-extension radiographs are first-line tests for suspected lumbar pathologies, and full-length lateral standing radiographs should be obtained to determine spinal curvature and spinopelvic sagittal balance (Figures 2 and 3). Lumbar spine MRIs are used to assess soft tissue and bony impingements, including nerve root and cord compression (Figure 4). Pain relief with an epidural steroid injection (ESI) suggests a primary spinal pathology. However, patients for whom ESIs have not provided pain relief may improve following lumbar decompression,[12] so a negative response to ESI should not exclude the lumbar spine as the underlying cause of symptoms.

Figures 1, 2, and 4 represent clinical radiographs from the same patient. Their clinical presentation is left-sided low back, buttock, hip, and groin pain without clear radicular pathology. So, is it the hip or the spine, or both?

Consequences of Misdiagnosis

Misdiagnosis or inappropriately characterized HiSS can range in consequences from simply continued symptoms of pain and discomfort to extraneous surgical procedures with failed outcomes, complications, and subsequent reoperations. Compensatory changes that occur secondary to altered spinopelvic parameters following a hip or spine surgery can be a source of continued pain and complication.

Following total hip arthroplasty (THA), patients with lumbar spine disease (lumbosacral spondylosis, lumbar disk herniation, acquired spondylolisthesis, and degenerative disk disease) experience a significant increase in risk for complication, with prosthetic hip dislocation the most common.[5,14]



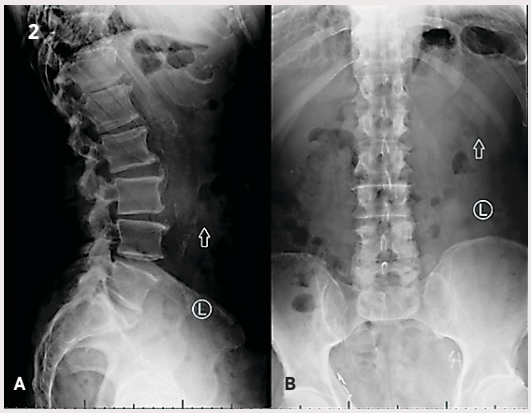


Figure 1. *(Left)* Standing low AP pelvis (A) and frog-lateral (B) showing moderate left hip osteoarthritis. **Figure 2.** *(Center)* Lateral (A) and AP (B) radiographs of the lumbar spine showing moderate osteoarthritis without spondylolisthesis. **Figure 3.** *(Right)* Schematic diagram of spinopelvic parameters on standing lateral scoliosis film (left) and zoomed in lumbar lateral radiograph (right). Sagittal Vertical Axis (SVA), Lumbar Lordosis (LL), Pelvic Incidence (PI).

Patients with prior spinal fusion had significantly higher rates of complications, including dislocation revision, loosening, and any prosthetic-related complication within 24 months.[15-17] Interestingly, when treating concomitant hip and spine pathologies, THA before spinal fusion is associated with decreased rates of hip dislocation and revision surgeries when compared to spinal fusion before THA, providing evidence of an optimized chronology.[18]

Patients with a previous lumbar fusion, particularly extending to the pelvis, jeopardize their spinopelvic accommodation, the ability of the pelvis to allow the increased motion required of change in posture.[19] Sacral slope and pelvic tilt are critical in defining the range of spinopelvic accommodation, which when reduced in association with increased lumbar lordosis can lead to posterior hip instability (Figures 4-6).[20]

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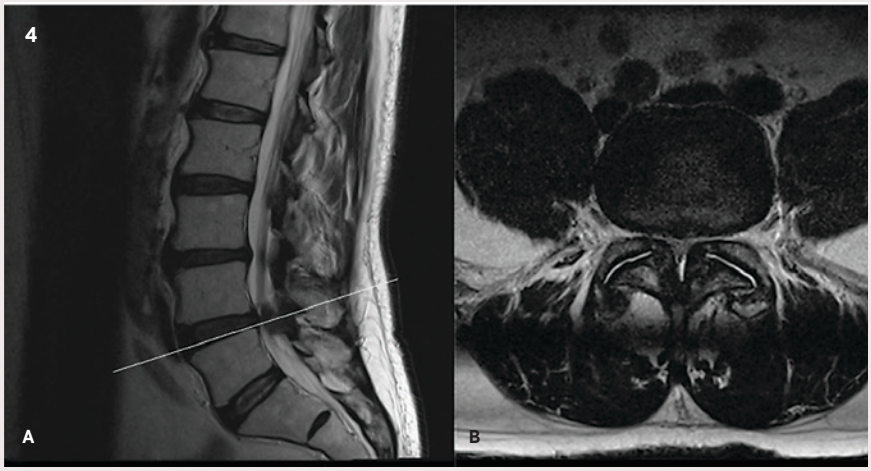

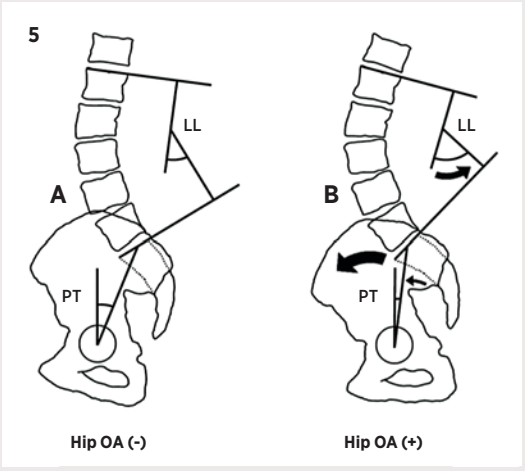

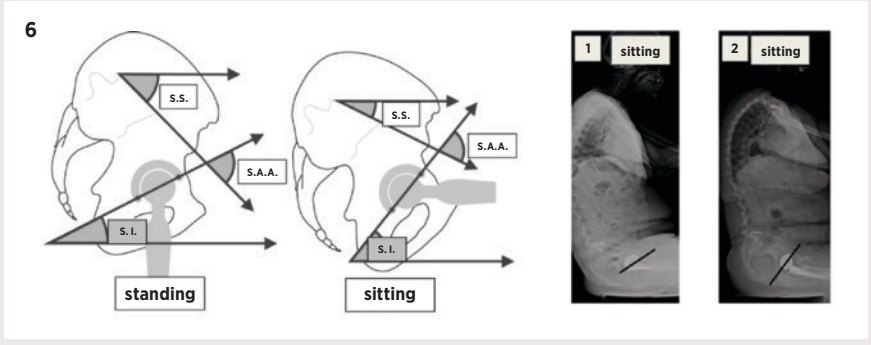

Figure 4. *(Above, Left)* T2-weighted mid-sagittal (A) and axial (B) MRI images showing severe lumbar spinal stenosis at the level of L4-L5. **Figure 5.** *(Above, Right)* The characteristics of PT and lumbar lordosis (LL) in patients with hip OA. Spinopelvic balance is shown in an individual without OA (Fig. 5A) and in an individual with OA (Fig. 5B). [3] Pelvic Tilt (PT), Lumbar Lordosis (LL). **Figure 6.**[19] *(Far Left)* Sacral slope (SS), Sacro-acetabular angle (SAA), Sacral inclination (SI) postural differences. Differences in low SI angle *(Near Left)* (1) and high SI angle (2) with high SI angle preventing anterior impingement.

Hip-Spine Syndrome *(Continued from Page 3)*

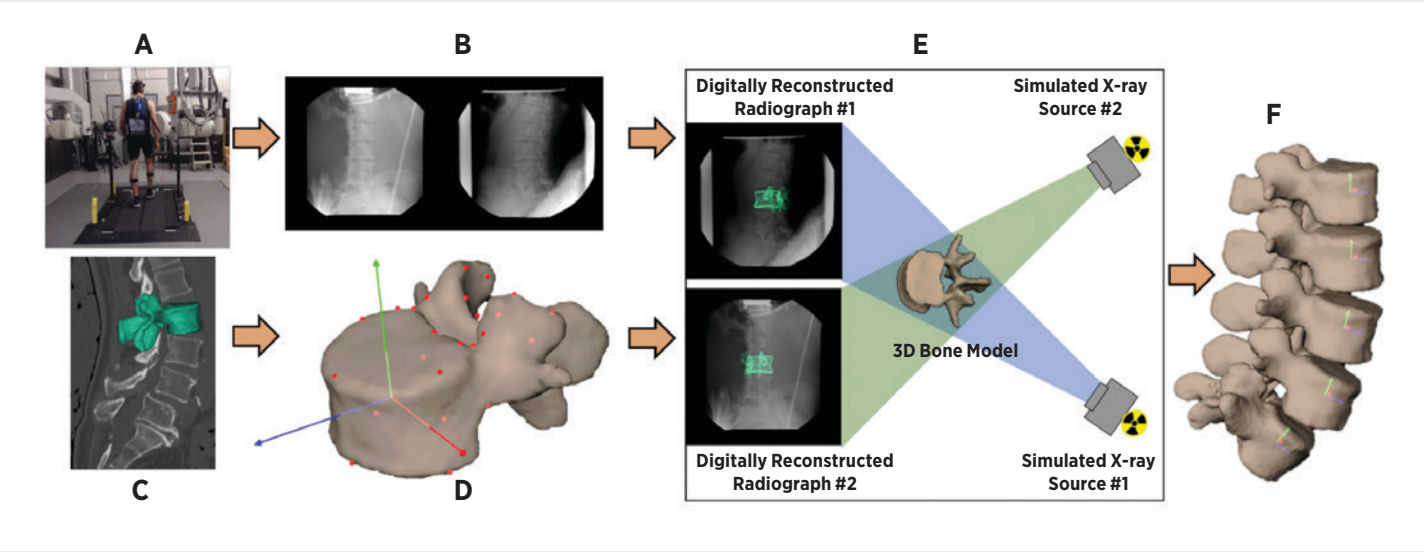

Figure 7: **A.** Participants performed six trials of level walking at a self-selected pace on an instrumented treadmill pre- and post-THA. **B.** Synchronized biplane radiographs were collected at 50 images per second for 1.2s per trial. **C.** Lumbar CT scans were collected and … **D.** Used to create 3D bone models. **E.** 3D lumbar spine kinematics were determined using a validated CT model-based tracking process. **F.** Lumbar orientation and position were tracked using an anatomical coordinate system for each vertebra in each radiographic image.

Specifically, a flexion deformity of the hip causes the pelvis to rotate anteriorly and develop compensatory hyperlordosis of the lumbar spine.[3] Correcting this hyperlordosis may decrease the anterior acetabular coverage, ultimately accelerating degeneration of the hip.[3] Compensatory hyperlordosis of the lumbar spine can result in foraminal stenosis and radicular symptoms.[2,4] These altered spinopelvic kinematics impact the range of acetabular positioning with decreased pelvic tilt causing acetabular retroversion, while increased pelvic tilt causes acetabular anteversion, either of which increases risk for dislocation.[4]

Current Research

The impact of THA on spinopelvic alignment parameters has been shown to reduce not only hip pain but also low back pain.[21-24] In patients receiving a hip arthroplasty for OA with low back pain prior to surgery, symptom reduction is linked to improved spinopelvic parameters and corrected femoral neck anteversion of the arthritic hip.[22,23] Two-thirds of patients who present with coexisting hip and spine pathologies with lumbar pain have reduced pain following THA, with half of the original patient population having known spine disorders.[21]

Several studies have investigated the mechanisms in which lumbar spine pathology affects the hip; however, limited literature exists describing the mechanism by which hip pathology impacts the spine.[25,26] Furthermore, these studies do not investigate active, dynamic patient kinematics, which is crucial to understanding the relationship between the hip and spine in HiSS.

Current prospective work at the University of Pittsburgh Department of Orthopaedic Surgery Biodynamics Laboratory (BDL) seeks to better describe the dynamic relationship of these coordinated joint pathologies. Specifically, investigators are studying changes in lumbar kinematics that lead to the resolution of low back pain following total hip arthroplasty. This study involves using a custom volumetric-based bone model tracking system to monitor three-dimensional bone kinematics throughout the full gait cycle.[27-32] Using biplane radiography, lumbar images are recorded while subjects walk at a self-selected pace. This data, along with a CT scan, are used to complete a 3D skeletal reconstruction of dynamic motion[27] (Figure 7). Trials are completed pre- and post-THA to quantify dynamic lumbar kinematic changes while walking, since many patients suffer pain while upright and walking. This study also hopes to identify static and kinematic diagnostic parameters to predict low back pain resolution in patients receiving THA. With results from this study, the BDL aims to aid clinical diagnosis and therapeutic decision-making in patients with HiSS.

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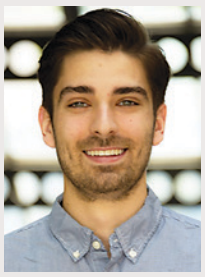

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Current Considerations in the Surgical Treatment of Anterior Cruciate Ligament Tears

Introduction

Anterior cruciate ligament (ACL) injuries are common, with an incidence of 68.6 per 100,000 person-years in the United States. Furthermore, more than 75% of individuals with an ACL injury undergo surgical treatment.[1] Surgery is frequently recommended to avoid the development of subsequent meniscal tears, osteoarthritis, and a need for total joint arthroplasty associated with nonoperative management, particularly in young, active patients.[2-4] Despite the steady increase in ACL research, questions persist regarding the optimal surgical technique for the treatment of ACL injuries, including the timing of surgery after injury, repair versus reconstruction, graft type, and bundle quantity with anatomic reconstruction.[5-7] The purpose of this article is to summarize these current considerations among orthopaedic surgeons to better understand the nature and direction of research and clinical practice surrounding the surgical treatment of ACL injuries.

Timing of Surgery

A landmark study in 1991 showed an increased incidence of knee arthrofibrosis after early ACL reconstruction within one week of injury compared to reconstruction performed within three weeks of injury.[8] This led many surgeons to favor delayed reconstruction, as proposed advantages include the opportunity for concomitant injuries to potentially be treated nonoperatively and the opportunity for the injured knee to regain full range of motion (ROM) preoperatively, resulting in an earlier return of full ROM postoperatively.[9] Some authors even recommend delaying surgery until two years after an ACL injury to minimize the risk of subsequent graft failure.[10,11]

However, recent studies have begun to challenge the advantage of delayed ACL reconstruction. In a recent systematic review and meta-analysis in which patients were grouped based on surgery performed prior to or after 10 weeks postinjury, no significant differences were found between patient-reported outcomes (PROs) or ROM, though improved Lachman and pivot shift examinations were seen at two and five years postoperatively in the early group when compared to the delayed group in one of three additional studies.[12] Additional meta-analyses, with various definitions of early or delayed surgery, have found no clinically significant difference between early and late surgery regarding PROs, complications, ROM, reinjury, or residual laxity.[13-15] Therefore, some surgeons are beginning to consider early surgical intervention to be a viable treatment option.

Repair Versus Reconstruction

For years, ACL reconstruction involving the use of graft material to create an entirely new ACL has been the gold standard for surgical treatment of ACL tears. ACL repair in which the ACL tear itself is directly repaired (Figure 1) was largely abandoned in the 1990s due to a high incidence of postoperative pain, stiffness, instability, and repair failure in poorly selected patients. However, this approach has begun to make a resurgence.[16-19] Proponents argue that ACL repair provides the advantage of a less invasive approach while preserving the native biology, proprioception, and anatomy of the ACL.[17,18,20]

While results of ACL repair in all patients have unacceptably poor outcomes, there is evidence that early repair of proximal ACL tears within two to four weeks of injury in young patients may result in outcomes similar to ACL reconstruction.[21] In addition, internal bracing and biologic augmentation of primary ACL repair have been shown to improve healing as seen on histology and the biomechanical properties of the repaired construct, but these findings have not yet been translated to clinical outcomes.[21] *Jonkergouw* found no significant difference in regards to failure, reoperation rate, or PROs for patients undergoing ACL repair with and without internal bracing in patients with isolated complete proximal ACL tears.[17] *van der List* found that when comparing primary ACL repair with reconstruction, ACL repair resulted in significantly improved early ROM prior to six months, which disappeared at six months.[18] However, it is important to note that only patients with proximal ACL tears underwent ACL repair, while patients with midsubstance tears, or with concomitant pathology, received ACL reconstruction. While ACL reconstruction has been the preferred surgical treatment for ACL tears for the last few decades, ACL repair is once again being viewed as a reasonable alternative with several advantages in carefully selected patients.

Graft Type

Another area of much research and debate surrounds the determination of optimal graft type used in ACL reconstruction. ACL grafts are broadly broken down into two main categories: autograft and allograft, with each having a variety of options available. Autograft options include autograft bone-patellar tendon-bone (BPTB), hamstring tendon (HS), and quadriceps tendon (QT). Allograft options include BPTB, HS, or QT allograft, as well as tibialis anterior or posterior, peroneus longus, or Achilles tendon allograft.

Numerous studies have been performed to compare the various graft types, but no graft option has emerged as the optimal choice. A recent review found no significant difference in graft failure rate among the use of QT, BPTB, or HS autografts in primary ACL reconstructions, while others have shown a decreased rate of failure when using BPTB rather than HS autograft.[22-24] In revisions, HS autograft studies have been

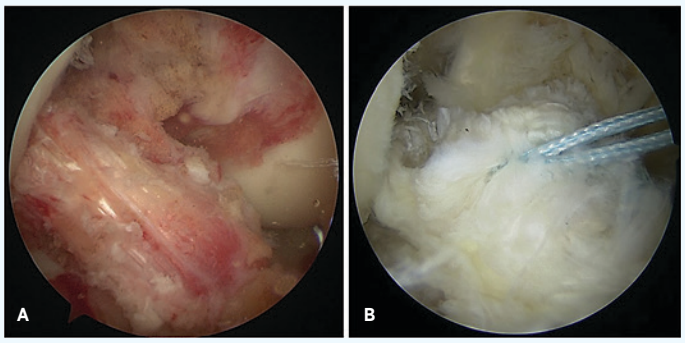

Figure 1. Intraoperative photographs depicting ACL reconstruction (**A**) and ACL repair (**B**) in a right knee.

shown to have a lower rate of complication and reoperation compared to BPTB.[25] While *Gorschewsky* found superior knee function and stability outcomes using BPTB rather than QT with bone block autograft, the majority of studies show QT to be minimally superior or equal to BPTB in regards to postoperative knee laxity, ROM, and PROs.[26-28] Likewise, studies comparing QT and HS autografts have shown that QT autograft resulted in minimally superior to equivalent PROs and knee stability.[22,29-31] When comparing BPTB and HS autografts, BPTB has been found to be superior in regards to decreased laxity with pivot shift testing and return-to-preinjury activity level.[32] In comparing autograft versus allograft, BPTB autograft was found to have a significantly lower rate of revision ACL reconstruction compared to BPTB allograft and has been shown to be superior to various allograft options in young, active patients.[33-35] No difference has been shown between the use of HS autograft versus nonirradiated allograft.[25] Thus, no clear advantage is seen in knee stability, clinical outcomes, complications, or graft failure among graft types, except for BPTB autograft in young, active patients.

As a result, graft choice is determined by various other factors, such as lack of donor site morbidity or risk of disease transmission with allograft, increased risk of anterior knee pain associated with BPTB autograft, relative decreased hamstring strength seen with HS autograft, or surgeon recommendation.[22,27,28,31,32,36] Therefore, while many options exist, no graft choice is clearly superior. Further study is needed to determine the best graft options for patients.

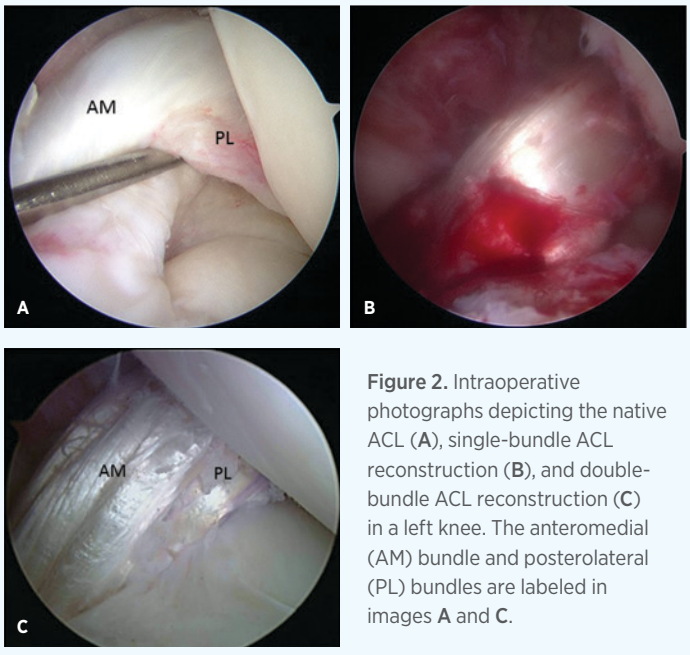

Figure 2. Intraoperative photographs depicting the native ACL (**A**), single-bundle ACL reconstruction (**B**), and double-bundle ACL reconstruction (**C**) in a left knee. The anteromedial (AM) bundle and posterolateral (PL) bundles are labeled in images **A** and **C**.

One Bundle or Two?

When performing an ACL reconstruction, there is a choice to use a graft consisting of a single-bundle (SB) or double-bundle (DB) (Figure 2). While reconstruction with a DB graft recreates the anatomy of the native ACL, there are instances where the use of a DB graft is impossible, as in cases with a small tibial insertion site, narrow notch, open physes, advanced arthritic changes, and severe bone bruising.[37-39] In the majority of studies comparing anatomic SB with anatomic DB ACL reconstruction, DB reconstruction has been found to result in greater knee stability, though improved patient outcomes have not been shown.[39-44] Regarding complication or failure rates, meniscal injury, and progression of arthritis, some studies have shown the superiority of DB in comparison to SB reconstruction, although the results are mixed and the quality of data is limited, so additional evidence is needed.[41,43,45-47]

Closely related to, but distinct from, DB ACL reconstruction is the concept of anatomic ACL reconstruction. Anatomic ACL reconstruction refers to a surgery that functionally restores the ACL to its native dimensions, collagen orientation, and insertion sites.[48,49] There has been continued interest in anatomic ACL reconstruction, as technical error is reported as the etiology of the majority of ACL reconstruction failures.[50] Anatomic ACL reconstruction has often erroneously been used interchangeably with DB ACL reconstruction; however, the two should not be used interchangeably, as a DB reconstruction can be nonanatomic if the femoral and tibial tunnel sites do not match those of the native ACL.[48,51] To assess how anatomic an ACL reconstruction is, a checklist has been created to enable surgeons to evaluate an ACL reconstruction.[49] A recent study found an increased incidence in the long-term development of osteoarthritis in patients having undergone a nonanatomic versus anatomic reconstruction based on the score calculated with the use of this checklist.[52] Therefore, anatomic reconstruction may be critical in long-term knee function but is distinct from DB reconstruction.

Conclusion

Much discussion and debate exist as to the best method of surgical treatment for ACL injuries. While surgical timing, ACL repair versus reconstruction, graft type, and bundle number with anatomic reconstruction do not represent every issue currently being addressed, these do represent some of the topics at the forefront of discussion today. Continued research is necessary to uncover the answers to these important questions to determine the best surgical treatment strategies that will lead to the best outcomes for patients.

(Continued on Page 8)

Anterior Cruciate Ligament Tears *(Continued from Page 7)*

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DEPARTMENT BRIEFS

- World-renowned artist Burton Morris, a Pittsburgh native and CMU alumnus, visited the UPMC Freddie Fu Sports Medicine Center in April 2019 to donate a piece of art in honor of the Sports Center renaming. The donated painting was originally commissioned for the 2010 FIFA® World Cup® held in South Africa and was subsequently exhibited around the world. The painting joins the unique art collection previously donated by Mr. Morris at the opening of the Sports Center in 2000. This comprises the largest collection of Mr. Morris's artwork in the world, bringing undeniable vibrancy to the Sports Center!
- Nineteen physicians from the **Department of Orthopaedic Surgery** were selected by *Pittsburgh Magazine* as 2019 **Best Doctors**.
- In June 2019, the Department hosted the **ACL Consensus Meeting – Panther Symposium 2019** at the University Club in Pittsburgh, Pennsylvania. Co-directed by **Freddie H. Fu, MD**, and **Volker Musahl, MD**, this three-day conference featured inspiring and engaging presentations and live surgeries with more than 55 nationally and internationally recognized colleagues and leading sports medicine experts.

A memorial was held in May 2019 for **Henry Mankin, MD**. Dr. Mankin passed away peacefully in December 2018, in Boston, Massachusetts. A native of Pittsburgh, he was a 1953 graduate of the University of Pittsburgh School of Medicine. Dr. Mankin was faculty in the Department of Orthopaedic Surgery at the University of Pittsburgh, working with Dr. Ferguson in the 1960s. He then became the chair of orthopaedic surgery at New York University and subsequently assumed the Harvard University MGH Chair until he retired in the 1990s. Dr. Mankin was a world-renowned tumor surgeon and a fantastic educator who trained generations of orthopaedic leaders. He served as a board of overseers member of the University of Pittsburgh School of Medicine. He was inducted into the Taylor Allderdice High School Hall of Fame, where he was a classmate and neighbor of the late Myron Cope, the Pittsburgh Steelers broadcaster and inventor of the Terrible Towel. Dr. Mankin's wife Carole passed away a few years ago. His son, Keith, also is a University of Pittsburgh School of Medicine alumnus and an orthopaedic surgeon in North Carolina.

New Faculty

Timothy W. Dancy, MD, joined the Division of Primary Care Sports Medicine in September 2019 as an assistant professor. Dr. Dancy earned his medical degree at the University of North Carolina School of Medicine in May 2000. He completed residency training in family practice at UPMC Shadyside in 2003 and fellowship training in primary care sports medicine in 2004. He practiced in South Carolina from 2004 through 2012 before returning to the Pittsburgh area in 2013.

Aashish Jog, MD, transferred to the University of Pittsburgh Physicians in July 2019. Dr. Jog received his medical degree from Byramjee Jeejeebhoy Medical College and completed an orthopaedic surgery residency at Bharati Vidyapeeth Deemed University Medical College. Dr. Jog pursued fellowship training in sports medicine at the University of Pennsylvania and foot and ankle surgery at UPMC. Upon completion of his UPMC foot and ankle fellowship, he remained with Orthopaedic Associates as a practicing physician. Dr. Jog provides orthopaedic care at Trinity Health Systems.

Nilesh K. Patil, MD, transferred to the University of Pittsburgh Physicians in July 2019. Dr. Patil earned his medical degree from BJ Medical College in Pune, India. He completed orthopaedic residency training at Seth G.S. Medical College & King Edward VII Memorial Hospital, in Mumbai, India, followed by an adult reconstructive fellowship. He held appointments with Stanford Medical Center and Wake Forest University before pursuing additional fellowship training in adult reconstruction at Insall Scott Kelly Institute in NY and sports medicine at Penn State Orthopaedics.

Vivek Sharma, MD, transferred to the University of Pittsburgh Physicians in July 2019. Dr. Sharma earned his medical degree from the University of Mumbai. He remained in Mumbai to complete postgraduate training. He moved to the United States and completed advanced fellowship training in spine surgery and pediatric orthopaedics at the University of Cincinnati, Cincinnati Children's Hospital, sports medicine and arthroscopy at Boston Children's Hospital, and joint replacement at the University of Minnesota/VA Medical Center. Previously, he was a staff orthopaedic surgeon at the HaysMed Orthopedic Institute, Kansas University Health System, and served as team physician for Fort Hays State University Athletics.

Anne Marie Zeller, DO, joined the Division of Primary Care Sports Medicine in October 2019 as an assistant professor. Dr. Zeller earned her medical degree at Des Moines University College of Osteopathic Medicine in May 2012. She completed an osteopathic family medicine residency at University Hospitals (Ohio) in 2015 and completed a primary care sports medicine fellowship at University Hospitals/Rainbow Babies & Children's Hospital, Cleveland Medical Center in 2017.

Promotions

John Fowler, MD, was promoted to associate professor of Orthopaedic Surgery. Dr. Fowler also serves as assistant dean for Medical Student Research.

Volker Musahl, MD, was promoted to professor with tenure, and he was appointed the Blue Cross of Western Pennsylvania Endowed Chair. Dr. Musahl also serves as chief of the Division of Sports Medicine; medical director of the UPMC Rooney Sports Complex; and program director for the Sports Medicine Fellowship Program.

Joon Lee, MD, was appointed to the Orland Bethel Professorship in Spine Surgery. Dr. Lee also serves as associate program director of the Orthopaedic Surgery Residency Program.

Faculty Notes

Freddie H. Fu, MD, chairman of the Department of Orthopaedic Surgery, gave many presentations and keynote lectures during 2019. A few of Dr. Fu's speaking engagements included:

- Presidential Speaker at the 2019 Hughston Society Biennial Meeting in Columbus, Georgia, in April 2019. Dr. Fu presented "60 Years of Cartilage Research."
- Keynote Speaker, APOA Sports Meeting 2019, in Kuala Lumpur, Malaysia, in April 2019. Dr. Fu's presentation was "Is the Latest Always the Greatest in Sports Medicine?"
- Keynote Speaker at the 2019 APKASS Summit and the 16th IFOSMA (International Forum of Orthopedic Sports Medicine and Arthroscopy) Conference in Chengdu, China, in April 2019. Dr. Fu's presentation was titled "What Is the ACL?"
- Keynote Speaker at the 2019 Inova Sports Medicine Summit in Fairfax, Virginia, in May 2019. Dr. Fu presented "Is the Latest in Sports Medicine Always the Greatest?"

MaCalus Hogan, MD, was appointed senior medical director of UPMC Health Plan Orthopaedic and Musculoskeletal Care Services effective August 2019.

Brian A. Klatt, MD, was appointed division chief of Adult Reconstruction in the Department of Orthopaedic Surgery in September 2019.

- **Dr. Klatt** was the medical honoree at the 2019 Bone Bash in September 2019 hosted by the Arthritis Foundation. Also honored were Dr. Peter Cohen with the Lifetime Achievement Award and Dr. John Perri with the System Lifetime Achievement Award.

Hang Lin, PhD, was selected to participate in the 2019 Butler-Williams Scholars Program offered by the National Institutes of Health National Institute on Aging. The program provides an opportunity for researchers to attend lectures, seminars, and small group discussions in research design relative to aging.

Z. Deniz Olgun, MD, was named director of Pediatric Orthopaedic Residency Education. In this role, she will coordinate the didactic educational talks for the pediatric orthopaedic program, help to more formally direct the educational program for the residents on rotation at UPMC Children's Hospital of Pittsburgh, and interface with Timothy Ward, MD, chief of the Division of Pediatric Orthopaedic Surgery, MaCalus Hogan, MD, and Joon Lee, MD, on educational issues pertinent to pediatric orthopaedics. Dr. Olgun has been very active in teaching residents, and this new title reflects the importance of that activity and rewards her with an appropriate expanded role within the Division.

Gwendolyn Sowa, MD, PhD, chair of the Department of Physical Medicine and Rehabilitation and the UPMC Rehabilitation Institute, and **Nam Vo, PhD**, associate professor of Orthopaedic Surgery, were awarded more than $16 million to establish the LB³P MRC, a multidisciplinary research center dedicated to categorizing patients into chronic low back pain subgroups with the goal of targeting treatments specific to individual patient's pain and reducing the use of opioids.

Bing Wang, PhD, and **Kurt R. Weiss, MD**, were selected to participate in the 2019 Advanced Faculty Leadership Academy. This year-long professional development program is designed to cultivate a generation of transformative academic leaders through shared leadership training. The half-day sessions began in January and are held once a month through December 2019.

Awards

Micky Collins, PhD, and **Anthony Kontos, PhD**, received the Centers for Disease Control and Prevention *National Center for Injury Prevention Special Emphasis Panel CE-18-003: Research on Improving Pediatric mTBI Outcomes Through Clinician Training, Decision Support, and Discharge Instructions* research grant for their project titled, "Active Injury Management after Pediatric Concussion." Dr. Kontos will serve as co-primary investigator and Dr. Collins will serve as co-investigator on the four-year, $2.11 million project (with $1.08 million to the University of Pittsburgh).

Kurt Weiss, MD, and **Rebecca Watters, PhD**, received a two-year, $133,775 grant from the Shadyside Hospital Foundation. This grant award will help fund a clinical coordinator for the tumor collections and studies of the Musculoskeletal Oncology Lab.

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UPMC PHYSICIAN RESOURCES

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