



State of Hip Preservation

Annual Report on Global Trends in Pre-Arthritic Hip Disorders

Diagnosis, treatment strategies, and emerging research in hip preservation surgery.

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Executive Summary

Over the past two decades, the field of hip preservation has undergone rapid evolution. Greater awareness of pre-arthritic hip disorders — particularly femoroacetabular impingement (FAI), hip dysplasia, and hip instability — has transformed how clinicians evaluate and treat hip pain in young and active patients.

Advances in imaging, surgical techniques, and rehabilitation protocols have expanded treatment options while also highlighting the importance of accurate diagnosis and thoughtful patient selection. At the same time, emerging research continues to refine our understanding of when non-operative management, arthroscopic intervention, or structural correction procedures may be most appropriate.

The **State of Hip Preservation Report** provides an overview of key developments shaping the field today.

Major themes identified in this report include:

- Continued growth in hip arthroscopy procedures worldwide
- Increased recognition of borderline dysplasia and hip instability
- Evolving decision-making around arthroscopy versus structural correction procedures
- Expanded emphasis on non-operative treatment strategies
- Variability in treatment approaches across international health systems
- Growing interest in outcomes research and long-term joint preservation

As research continues to advance and clinical experience grows, hip preservation remains a dynamic field focused on improving outcomes for young and active patients with pre-arthritic hip disorders.

The Evolution of Hip Preservation

Over the past two decades, the understanding of hip pain in young and active patients has changed substantially. Historically, many patients with persistent hip pain were either misdiagnosed or treated only after the development of significant joint degeneration. In many cases, the underlying structural causes of hip pain were not fully recognized until the progression to osteoarthritis.

Advances in imaging technology, clinical research, and surgical techniques have significantly improved the ability to identify structural abnormalities of the hip earlier in the disease process. Conditions such as **femoroacetabular impingement (FAI)**, **hip dysplasia**, **labral tears**, and **hip instability** are now recognized as important contributors to pre-arthritis hip pain. Early identification of these conditions has allowed clinicians to pursue treatment strategies aimed at preserving the native hip joint rather than managing symptoms after degeneration has occurred.

At the same time, the growth of hip arthroscopy has expanded the range of surgical treatment options available for patients with hip pathology. Arthroscopic techniques now allow surgeons to address cam and pincer morphology, repair or reconstruct the acetabular labrum, and manage capsular laxity with minimally invasive approaches. While these advancements have improved outcomes for many patients, they have also introduced new challenges related to patient selection and surgical indications.

In parallel, structural correction procedures such as **periacetabular osteotomy (PAO)** continue to play a critical role in the management of hip dysplasia and instability. These procedures address underlying acetabular coverage abnormalities and aim to restore more normal hip joint mechanics.

As awareness of these conditions has grown, clinicians have also placed greater emphasis on the role of **non-operative management**, including targeted physical therapy, activity modification, and rehabilitation strategies designed to optimize hip stability and function.

Today, hip preservation represents a multidisciplinary field that integrates imaging, biomechanics, surgical innovation, and rehabilitation science. Continued research and collaboration among orthopedic surgeons, sports medicine physicians, and physical therapists are essential to improving diagnostic accuracy and refining treatment strategies.

The sections that follow examine key trends currently shaping the field of hip preservation, including diagnostic challenges, evolving surgical decision-making, and emerging research directions.

Epidemiology of Hip Pain in Young Patients

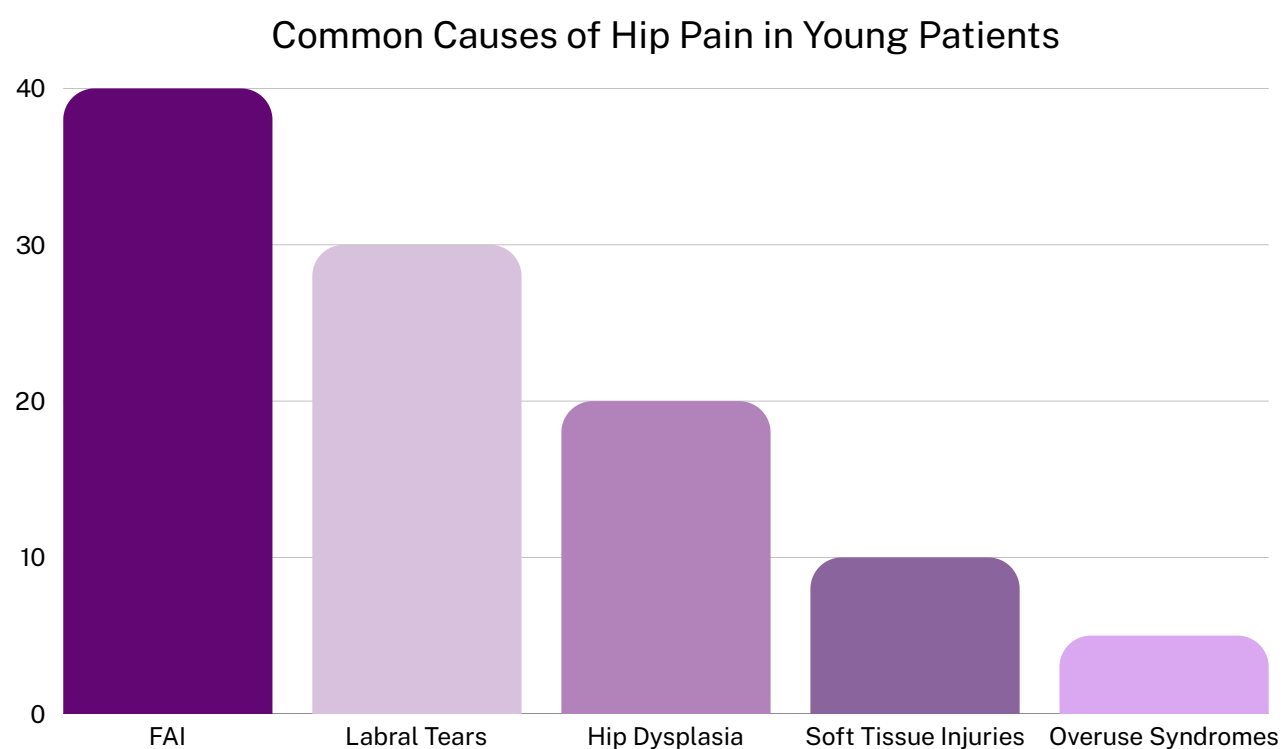
Hip pain is increasingly recognized as a significant problem among young and active individuals. While hip osteoarthritis has traditionally been associated with older populations, research over the past two decades has shown that many cases of joint degeneration may originate from structural abnormalities present earlier in life.

Conditions such as **femoroacetabular impingement (FAI)**, **hip dysplasia**, and **labral tears** are now recognized as important causes of hip pain in adolescents, young adults, and athletes. These conditions may alter the mechanics of the hip joint, leading to abnormal contact forces and progressive joint damage if left untreated.

A common challenge in hip preservation is **delayed diagnosis**. Many patients experience symptoms for months or even years before the underlying structural cause of their pain is identified. Symptoms may initially be attributed to muscle strain, tendon injury, or other musculoskeletal conditions.

Athletes participating in sports that involve **repetitive hip flexion, rotation, or high loading of the hip joint** may be particularly susceptible to hip pathology. Increased awareness among clinicians has improved recognition of these conditions, but variability in diagnostic pathways remains common.

Early identification of structural hip disorders is an important goal of modern hip preservation, as timely treatment may help protect the native hip joint and reduce the risk of long-term degeneration.



Trends in Femoroacetabular Impingement (FAI)

Femoroacetabular impingement (FAI) has become one of the most widely recognized causes of hip pain in young and active patients. First described in detail in the early 2000s, FAI refers to abnormal contact between the femoral head–neck junction and the acetabular rim during hip motion.

Two primary morphological patterns of impingement are typically described:

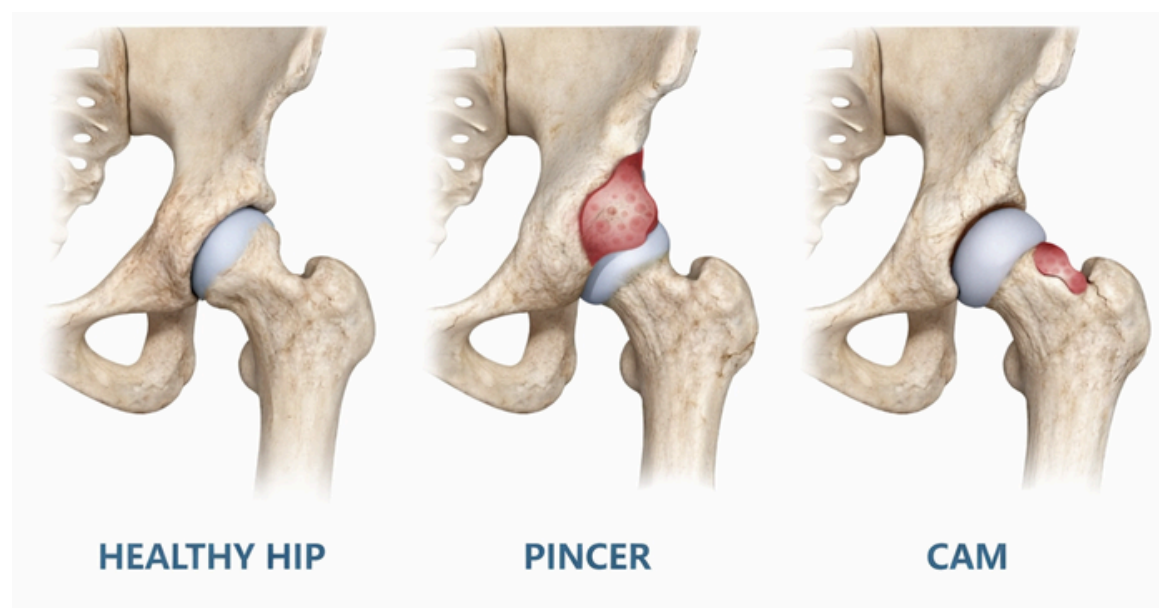
- **Cam morphology**, characterized by loss of the normal femoral head–neck offset
- **Pincer morphology**, involving acetabular overcoverage of the femoral head

These structural variations may lead to increased mechanical stress within the hip joint, particularly affecting the acetabular labrum and adjacent cartilage.

Over the past two decades, increasing recognition of FAI has contributed to a significant expansion in **hip arthroscopy procedures**. Advances in arthroscopic techniques have allowed surgeons to reshape cam deformities, address pincer morphology, repair labral injuries, and manage capsular laxity with minimally invasive approaches.

At the same time, ongoing research has emphasized the importance of **careful patient selection and accurate diagnosis**. Many individuals demonstrate radiographic features of cam or pincer morphology without symptoms, highlighting the need to correlate imaging findings with clinical presentation.

As the understanding of FAI continues to evolve, clinicians are increasingly focused on refining diagnostic criteria, improving surgical techniques, and identifying patients who are most likely to benefit from intervention.



Cam and pincer morphologies represent structural variations that may contribute to femoroacetabular impingement and labral injury during hip motion.

Borderline Dysplasia and Diagnostic Challenges

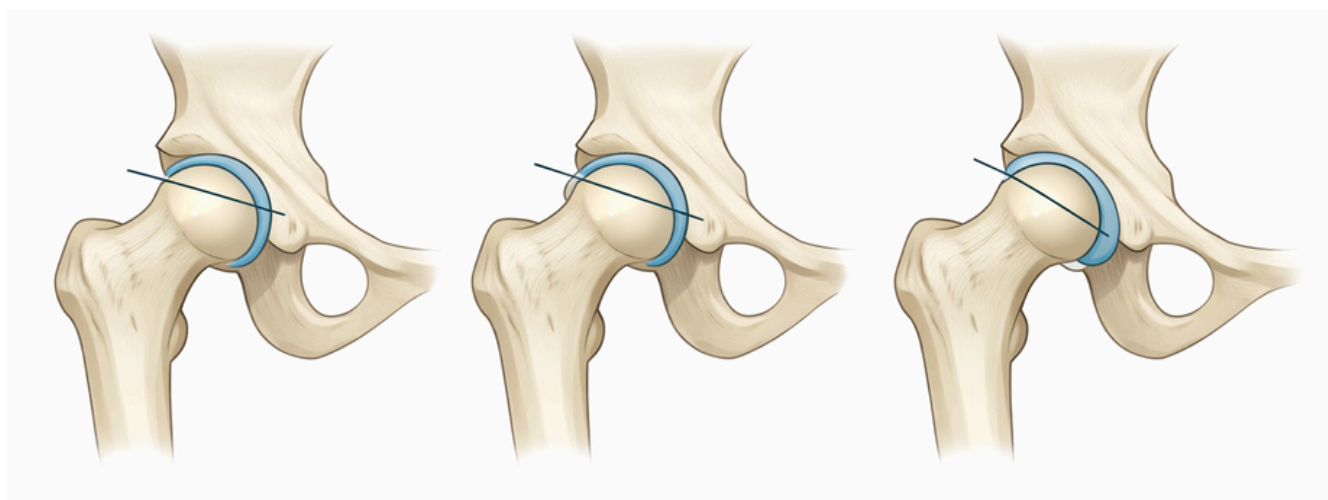
Hip dysplasia has long been recognized as an important cause of hip instability and early joint degeneration. Traditionally, dysplasia has been defined by insufficient acetabular coverage of the femoral head, often measured radiographically using the **lateral center-edge angle (LCEA)**.

In recent years, increasing attention has focused on patients who fall within a diagnostic gray zone often referred to as borderline dysplasia. These patients may demonstrate mild reductions in acetabular coverage that do not meet classic definitions of dysplasia but may still contribute to hip instability and labral injury.

Borderline dysplasia presents significant diagnostic challenges. Patients may experience symptoms similar to those seen in femoroacetabular impingement, including groin pain, mechanical symptoms, and activity-related discomfort. However, the underlying biomechanical problem may differ substantially.

In some cases, patients with subtle instability may undergo arthroscopic procedures addressing labral pathology or impingement morphology without correction of the underlying structural instability. This has led to increasing discussion within the hip preservation community regarding appropriate patient selection and the role of structural procedures such as **periacetabular osteotomy (PAO)**.

Improved imaging interpretation, careful clinical examination, and a comprehensive understanding of hip biomechanics are essential for distinguishing between impingement-dominant pathology and instability-related conditions. As awareness of borderline dysplasia continues to grow, clinicians are increasingly focused on refining diagnostic criteria and optimizing treatment strategies for these complex cases.



Normal acetabular coverage may gradually decrease along a spectrum, with borderline dysplasia representing a transitional zone between normal anatomy and more pronounced dysplasia.

Arthroscopy vs Structural Correction: Evolving Surgical Decision-Making

As the understanding of hip preservation continues to advance, clinicians are increasingly focused on determining which patients are most likely to benefit from specific treatment approaches. In many cases, the decision-making process involves distinguishing between conditions driven primarily by **impingement**, **instability**, or a combination of both.

Hip arthroscopy has become an important tool for treating intra-articular pathology, including labral tears, cam deformities, and pincer morphology. Arthroscopic techniques allow surgeons to address mechanical sources of impingement while preserving surrounding soft tissues and minimizing surgical morbidity.

However, in patients with underlying structural instability – such as those with significant acetabular undercoverage – arthroscopy alone may not adequately address the underlying biomechanical problem. In these cases, structural procedures designed to restore more normal acetabular coverage may be required.

One of the most widely recognized procedures for correcting structural instability related to hip dysplasia is the **periacetabular osteotomy (PAO)**. This operation involves reorienting the acetabulum to improve femoral head coverage and restore more favorable joint mechanics.

Determining the appropriate treatment strategy often requires careful evaluation of multiple factors, including patient symptoms, radiographic measurements, hip stability, and functional demands. As research continues to evolve, many hip preservation specialists emphasize a **patient-specific approach** that considers both the structural anatomy of the hip and the clinical presentation.

Ongoing collaboration between orthopedic surgeons, sports medicine physicians, and rehabilitation specialists remains essential in refining treatment algorithms and improving long-term outcomes for patients with pre-arthritis hip disorders.

Non-Operative Management Trends in Hip Preservation

While surgical techniques have advanced significantly in recent years, non-operative management remains a foundational component of hip preservation care. Many patients with pre-arthritic hip pain benefit from structured rehabilitation programs that focus on improving hip stability, strength, and movement mechanics.

Physical therapy often plays a central role in this process. Rehabilitation strategies commonly emphasize strengthening of the hip abductors, deep rotators, and core musculature, which contribute to dynamic stabilization of the hip joint during activity. Addressing neuromuscular control and correcting movement patterns may help reduce abnormal joint loading and alleviate symptoms.

Activity modification is another important component of conservative treatment. Patients may benefit from temporarily reducing activities that place high stress on the hip joint, such as deep flexion movements, repetitive pivoting, or high-impact athletic participation. Gradual return to sport or activity is typically guided by symptom improvement and functional progress.

In addition to rehabilitation and activity modification, other non-operative strategies may include anti-inflammatory medications, targeted injections, and patient education regarding joint mechanics and long-term hip health.

Increasingly, clinicians recognize that not all structural abnormalities require immediate surgical intervention. Many individuals with imaging findings such as cam morphology or mild dysplasia remain asymptomatic or respond well to conservative treatment. As a result, modern hip preservation strategies often emphasize a stepwise approach that begins with comprehensive non-operative care before considering surgical intervention when appropriate.

Collaboration between orthopedic surgeons, physical therapists, athletic trainers, and sports medicine specialists is essential to optimizing non-operative treatment plans and improving patient outcomes.

“Non-operative care remains a critical first step in the management of many pre-arthritic hip conditions.”

Imaging and Diagnostic Pitfalls in Hip Preservation

Imaging plays a central role in the evaluation of patients with suspected hip pathology. Radiographs, magnetic resonance imaging (MRI), and computed tomography (CT) scans provide valuable information regarding bony morphology, soft tissue structures, and joint integrity. However, interpreting these studies requires careful correlation with the patient's clinical presentation.

One of the most common diagnostic challenges is the presence of **imaging findings in asymptomatic individuals**. Studies have demonstrated that structural variations such as cam morphology or labral abnormalities may be identified on imaging in patients who do not report hip pain. As a result, imaging findings alone should not be used to determine treatment decisions without appropriate clinical context.

Radiographic measurements can also vary depending on patient positioning, imaging technique, and observer interpretation. Measurements such as the **lateral center-edge angle (LCEA)**, **alpha angle**, and **acetabular inclination** are commonly used to evaluate hip morphology, but small variations in measurement technique may influence classification of hip anatomy.

Magnetic resonance imaging is frequently used to evaluate the acetabular labrum and articular cartilage. While MRI can provide valuable information regarding intra-articular pathology, subtle labral injuries or cartilage damage may be difficult to identify on standard imaging sequences. In some cases, specialized studies such as **MR arthrography** may improve diagnostic accuracy.

Given these challenges, imaging should be interpreted as part of a comprehensive evaluation that includes patient history, physical examination, and functional assessment. A careful, multidisciplinary approach helps ensure that treatment decisions are based on the full clinical picture rather than isolated imaging findings.

Radiographs	MRI	CT
Bone structure	Labrum & cartilage	Version & 3D anatomy

Radiographs provide information about bony morphology, MRI evaluates soft tissue structures, and CT imaging can help assess complex three-dimensional anatomy.

International Differences in Hip Preservation

Approaches to hip preservation can vary significantly across different regions of the world. Differences in healthcare systems, training environments, surgical traditions, and access to specialized care all influence how hip disorders are diagnosed and treated.

In the **United States**, hip arthroscopy has expanded rapidly over the past two decades. The widespread adoption of minimally invasive techniques has allowed surgeons to address femoroacetabular impingement, labral pathology, and other intra-articular abnormalities with increasing precision. Many centers emphasize early recognition of structural pathology and intervention before the development of advanced joint degeneration.

In contrast, some **European healthcare systems** have historically placed greater emphasis on structural correction procedures for conditions such as hip dysplasia. Surgeons in these settings often have extensive experience with osteotomy procedures aimed at restoring acetabular coverage and improving joint biomechanics.

International collaboration has helped expand the exchange of knowledge between these different approaches. Surgeons and researchers increasingly share data through international conferences, research collaborations, and training programs focused on hip preservation.

The growing global interest in hip preservation reflects a broader recognition that early identification and treatment of structural hip abnormalities may improve long-term joint health. Continued collaboration between institutions and specialists across different regions will likely play an important role in advancing research, refining treatment algorithms, and improving patient outcomes worldwide.

Programs that integrate expertise from multiple countries provide valuable opportunities to compare treatment strategies and expand clinical understanding of complex hip pathology.

Emerging Topics in Hip Preservation

As the field of hip preservation continues to mature, several emerging areas of research and clinical focus are shaping how clinicians evaluate and treat patients with hip pain. These developments reflect growing recognition that hip pathology often involves complex interactions between structural anatomy, joint stability, and patient-specific biomechanics.

Hip Microinstability

One topic receiving increasing attention is hip microinstability. Unlike more obvious structural instability associated with significant dysplasia, microinstability involves subtle laxity of the hip joint that may contribute to pain, labral injury, and functional limitations. Diagnosis can be challenging, as imaging findings may be subtle and clinical evaluation often requires careful assessment of joint stability and patient symptoms.

Femoral Version Abnormalities

Another area of growing interest involves femoral version abnormalities. Variations in femoral anteversion or retroversion can alter hip joint mechanics and influence both symptoms and treatment decisions. In certain patients, these rotational differences may contribute to impingement, instability, or persistent symptoms despite other treatments.

Revision Hip Arthroscopy

In addition, clinicians are increasingly focused on revision hip arthroscopy. As hip arthroscopy procedures have expanded over the past two decades, surgeons are encountering a growing number of patients who require additional procedures to address persistent symptoms, residual impingement, capsular insufficiency, or unrecognized structural instability.

Advances in imaging techniques, surgical technology, and rehabilitation strategies continue to improve understanding of these complex conditions. Ongoing research aimed at better defining diagnostic criteria and treatment algorithms will play an important role in guiding the future development of hip preservation care.

Future Directions in Hip Preservation

The field of hip preservation has advanced rapidly over the past two decades, driven by improved understanding of hip biomechanics, advances in imaging, and the development of both arthroscopic and structural surgical techniques. As awareness of pre-arthritic hip disorders continues to grow, clinicians are increasingly focused on identifying patients earlier in the disease process and tailoring treatment strategies to the underlying structural and functional causes of hip pain.

Future progress in hip preservation will likely depend on several key areas of development. Continued research is needed to better understand the natural history of structural hip abnormalities such as femoroacetabular impingement and borderline dysplasia. Long-term outcome studies will help clarify which patients benefit most from surgical intervention and which may be successfully managed with non-operative treatment.

Advances in imaging technology may also improve diagnostic accuracy. Improved three-dimensional imaging, motion analysis, and biomechanical modeling have the potential to enhance clinicians' ability to evaluate hip joint mechanics and identify subtle sources of instability or impingement.

In addition, increasing collaboration among orthopedic surgeons, sports medicine physicians, physical therapists, and researchers will continue to shape the evolution of hip preservation care. Multidisciplinary approaches that integrate surgical expertise with rehabilitation science and patient education may help optimize outcomes and improve long-term joint health.

As the field continues to evolve, the ultimate goal of hip preservation remains consistent: to **identify and treat hip disorders early, preserve the native joint, and maintain function and quality of life for young and active patients.**

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