

The growth and future of hip preservation surgery

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Introduction

The field of hip preservation surgery has seen significant development and growth over the past few decades. Largely due to increased understanding of the patho-mechanics of the hip, a growing interest in sports surgery, advancements in imaging techniques and the refinement of open and arthroscopic surgical techniques. This article explores the history, current practice and advancements that have helped shaped hip preservation surgery and the future of this sub-speciality in the UK.

Early influences and growth

A pivotal moment in the field came with the seminal work of Reinhold Ganz and colleagues from Switzerland in the late 1990s. Their development of the periacetabular osteotomy (PAO) for the treatment of acetabular dysplasia, along with their detailed description of femoroacetabular impingement (FAI) and its relationship to early-onset hip osteoarthritis, laid the foundation for a modern understanding of hip preservation surgery¹.

In the UK, the credit for performing the first hip arthroscopy and for popularising the technique goes to Richard Villar, who performed the procedure in 1988 in Cambridge. Villar's contributions extended beyond clinical practice; he also played a central role in the establishment of the International Society of Hip Arthroscopy (ISHA), further advancing global collaboration and education in this evolving subspecialty.

In the early days of hip arthroscopy, the effectiveness of the procedure remained uncertain due to the lack of large-scale randomised controlled trials. This changed with two landmark studies: the FASHIoN trial, led by Damian Griffin from Warwick, and the FAIT trial, led by Siôn Glyn-Jones from Oxford^{2,3}. Both studies demonstrated that hip arthroscopy provided superior outcomes compared to physiotherapy in the short term. These findings helped establish arthroscopy as the treatment of choice for FAI for patients.

The establishment of the Non Arthroplasty Hip Registry (NAHR) in the UK in 2012, largely due to the efforts of John Timperley, President of the British Hip Society at the time, marked another milestone. The initial aim of the registry was to collect longitudinal data on non-arthroplasty interventions to assess the effectiveness of preservation surgery and inform decisions on best practices guidance⁴. Since its inception, the registry has grown significantly under the leadership of Marcus Bankes, Vikas Khanduja, Ajay Malviya, and the current chair, Tony Andrade.

The NAHR leads the global field of hip preservation in outcome measurement, innovation, and clinical research. The registry currently houses data on over 25,000 patient pathways, analysis of which, has contributed to establishing guidelines and supporting multiple publications⁴⁻⁶. These findings have informed surgeons globally about the effectiveness of hip preservation surgery and about appropriate patient selection.

Looking forward, the future of the registry, appears exceptionally promising. Two major areas of growth include embedding large-scale randomised controlled trials directly into the registry, offering a cost-effective method to assess interventions and secondly by developing improved machine learning models, better predictions of long-term outcomes can be made following hip preservation surgery^{7,8}.

The evolving role of the British Hip Society in hip preservation

The British Hip Society (BHS) has evolved significantly over the years. Originally focused primarily on hip arthroplasty, the society now provides equal emphasis on trauma, hip preservation, primary hip replacement, and revision surgery. This transformation is largely attributed to the leadership and efforts of Vikas Khanduja during his presidency, who championed the inclusion of hip preservation as a core component of the society's mission. >>

The BHS has supported the growth of the subspecialty and fostered collaboration across the UK. Furthermore, development of several specialist hip preservation centres across the country has significantly contributed to the clinical and academic advancement in the field. Together, these initiatives have established the UK as a global leader in hip preservation surgery.

Current practice

Hip preservation surgery focuses on treating intra-articular and extra-articular hip disorders that cause pain and dysfunction, with the goal of improving quality of life and delaying or preventing the onset of osteoarthritis and/or the need for a joint replacement. Indications for hip preservation surgery continue to expand and include but are not limited to FAI, hip dysplasia, Perthe's disease, slipped capital femoral epiphysis (SCFE), and even extra-articular pathologies, such as snapping hip syndromes.

As these indications continue to grow and new impingement syndromes are increasingly described, it becomes essential to adopt a standardised diagnostic and clinical framework. Consistent terminology, thorough clinical examination protocols, and unified approaches to imaging and interpretation are critical for accurate diagnosis and effective treatment planning. Vikas Khanduja has led efforts in this direction by helping develop the ESSKA-EPHA-ESMA Consensus on Hip and Groin Pain in Physically Active Adults⁹. This consensus provides a comprehensive guideline on the terminology, clinical examination techniques and recommended investigations for patients presenting with hip and groin pain. The adoption of the ESSKA-EHPA-ESMA consensus represents an essential step forward in ensuring consistency in diagnosis and investigation across practitioners and centres. It is strongly recommended that these standards be regularly implemented in clinical practice to enhance diagnostic accuracy, guide treatment selection, and facilitate meaningful research collaborations.

Currently, the field of hip preservation surgery has expanded to include a variety of sophisticated procedures such as open surgical dislocation, periacetabular osteotomy, femoral osteotomy, hip arthroscopy and cartilage restoration techniques.

Learning curve, challenges and training in hip arthroscopy

The rate of revision surgery following hip arthroscopy is on the rise, and this trend is attributed to several factors including incomplete access to all compartments of the hip joint during the procedure, inadequate

correction of underlying pathologies and variability in surgical training. Hip arthroscopy is a technically demanding procedure, and the learning curve is one of the steepest amongst orthopaedic interventions. Common pitfalls occur not only during surgery but also in:

- Pre-operative assessment (e.g., poor patient selection).
- Intra-operative execution (e.g., inadequate resection or visualisation).
- Post-operative care (e.g., ineffective rehabilitation protocols or challenges with patient expectation).

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Mastering this procedure requires a deep understanding of hip patho-mechanics, imaging, patient stratification, and the specific indications for surgical intervention. Equally important is knowing *when not to operate*, a critical skill that often comes with training, experience, and mentorship. To ensure competence and minimise complications, the following training structure is recommended:

- At least two years of subspecialty fellowship training in hip preservation surgery:
 - One year focused on arthroscopic techniques.
 - One year dedicated to open hip preservation techniques (e.g., PAO, femoral osteotomy, and open surgical dislocation).
- Cadaver courses.
- Simulation-based training to build on basic arthroscopic skills and confidence.
- Ongoing mentorship during the transition to independent practice.
- Integration into a collaborative network of national and international colleagues for guidance and second opinions.

This approach fosters safe, evidence-based reflective practice, which is essential in this technically nuanced field.

The UK has emerged as a centre of excellence for hip preservation training, attracting both national and international fellows. Prominent training centres include London,

Oxford, Reading, Birmingham, Sheffield, Northumbria, Wrightington and Cambridge. In addition to long-term fellowships, short-term observational opportunities and structured cadaveric courses are available through organisations such as BHS, ESSKA, ISAKOS, SICOT and ISHA. These resources are instrumental in equipping the next generation of surgeons with the skills and judgement needed to advance the field safely and effectively.

The collaborative nature of hip preservation surgery

Hip preservation surgery is certainly a team sport and requires a multidisciplinary approach for ensuring excellent outcomes. Ideally, it requires a dedicated team of hip preservation surgeons with the expertise to perform a wide range of procedures, including hip arthroscopy, femoral and acetabular osteotomy, cartilage restoration procedures, and, if necessary, a joint replacement in the young. The ideal team also includes specialists in sports medicine, rheumatology, radiology and physiotherapists with a focus on hip preservation. Additionally, paediatric orthopaedic surgeons with an interest in hip preservation play a critical role in managing the congenital and developmental hip disorders in adolescents. Complex cases are best managed through a MDT approach via a national and international network of hip preservation experts who collaborate to discuss and guide treatment options.

The future of hip preservation surgery

The future of hip preservation surgery is undoubtedly bright, and significant technological advancements are poised to reshape the way we practice this craft. Technology will play a crucial role in automating processes such as segmentation and the calculation of key metrics, including the alpha angle, lateral central edge angle, acetabular index, femoral version, tibial torsion, acetabular version and joint space estimation. MRI techniques are also set to improve to allow us to assess the health of the articular cartilage more accurately. These innovations will enhance our ability to stratify disease, identify the most suitable candidates for hip preservation surgery and improve pre-operative planning. Computer assistance and robotics will help intra-operative execution, making the intervention both individualised and precise.

The integration of artificial intelligence and large datasets, such as those from the NAHR, will enable us to predict which patients are most suited for hip preservation surgery. This technology will help with decision-making and ensure we are providing the best interventions to those who need them most. >>



Figure 1: Future developments for the next era of hip preservation surgery.

Another exciting frontier in hip preservation surgery is the role of genetic research and biologic therapies. Genetic analysis and single-cell sequencing will help to identify new targets for treatment and biologic therapies hold the potential to significantly enhance healing, particularly in the case of articular cartilage. These innovations will be critical in the ongoing effort to optimise hip preservation procedures and improve long-term outcomes.

A few decades ago, the focus of hip preservation surgery was primarily on surgical technique – how to perform the procedure and achieve the best immediate results. Today, that focus has expanded to encompass the entire process, including pre-operative planning, disease stratification, patient selection, and post-operative rehabilitation. The next era of hip preservation surgery will focus on refining patient selection, optimising surgical timing, and increasing the use of surgical technology to enhance the precision and personalisation of operations (Figure 1).

The innovation hype cycle

A 727% increase in hip arthroscopy procedures from 2002 to 2013 was reported in the UK, and the same group predicted an increase of 1,388% by 2023 (Figure 2)¹⁰. Although hip arthroscopy experienced similar growth trajectories internationally during its early adoption, our recent evaluation of the HESS data indicates a notable 71% decrease in procedures in England from 2017/18 to 2020/21, marking a significant turning point and decline in procedural volumes following the peak around 2014¹¹. This pattern contradicts initial projections of sustained growth and is consistent with broader European trends.

These trends observed in hip arthroscopy reflect the typical life cycle of surgical innovation as can be seen in Figure 3.

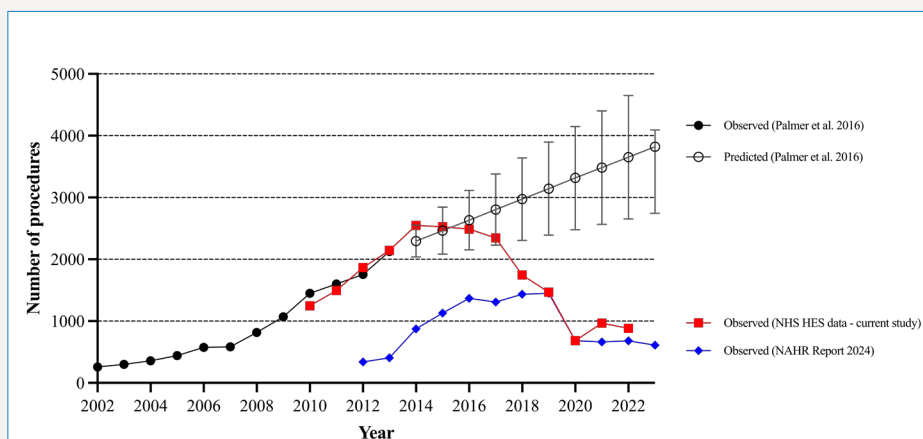


Figure 2: Annual numbers and trend of arthroscopic hip surgery between 2010 and 2023 in England.

Hip arthroscopy gained popularity in the late 20th and early 21st centuries due to promising early outcomes and low complication rates. Techniques were adapted for broadened indications, marking the exploration stage of surgical innovation. Yet, despite this growth, studies identified predictors of suboptimal outcomes, emphasising the need for careful patient selection when considering arthroscopic intervention, potentially tempering early enthusiasm and influencing changes in surgical practice. Hip arthroscopy may now be transitioning into the surveillance phase of surgical innovation, with an increasing focus on long-term outcomes from registry data, which may explain the stabilisation in procedural numbers from 2020/21 to 2022/23 as the surgical community seeks to refine indications and optimise patient outcomes based on maturing evidence.

Conclusion

Hip preservation surgery has evolved into an important sub-specialty within orthopaedics in the UK. Driven by a desire to address the needs of younger patients with hip pain and to delay the onset of osteoarthritis, UK surgeons have made significant contributions to the development and refinement of hip preservation techniques and research in this arena. With ongoing research, technological advancements and a commitment to education and training, the field is poised for continued growth and will play an increasingly important role in improving the lives of young adults with hip pathology. ■

References

References can be found online at www.boa.ac.uk/publications/JTO.

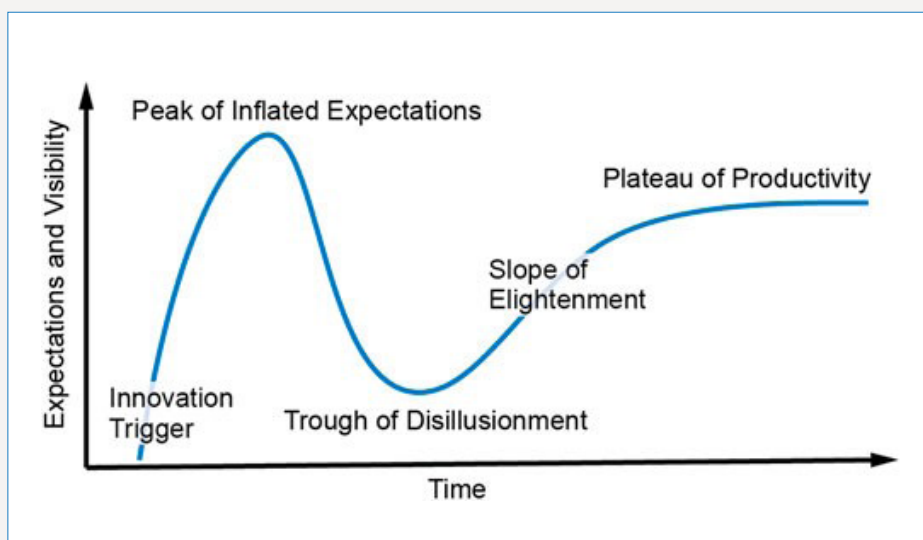


Figure 3: The typical life cycle of surgical innovation¹².