Knee Surgery, Sports Traumatology, Arthroscopy (2023) 31:2540–2543
https://doi.org/10.1007/s00167-023-07409-9

EDITORIAL

The growth of hip preservation as a speciality

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Received: 28 February 2023 / Accepted: 28 March 2023 / Published online: 12 April 2023

Introduction

The growth of hip preservation as an orthopaedic subspecialty has seen a surge in recent years, with more procedures being performed and more surgeons pursuing a career in this field. Hip preservation aims to prevent or delay the onset of degenerative changes in the hip, addressing both intra-articular and periarticular causes of hip pain in non-arthritic patients and consequently the procedures are mostly performed on active, young patients. Despite its increasing popularity, hip preservation lacks well-established training programs and career pathways. In this article, we will examine the current practices, evolution, and the state of training pathways for hip preservation surgery. This article will also delve into the current state of hip preservation, including its applications, practices, and development as a subspecialty.

Current practice of hip preservation

Hip preservation procedures encompass both open and arthroscopic surgical techniques, including surgical hip dislocation, periacetabular osteotomy, femoral osteotomy, procedures on the femoral head and hip arthroscopy. Hip arthroscopy, a minimally invasive surgical technique is now beginning to supersede open surgical dislocation and is used to treat an increasing number of conditions affecting the hip joint, such as femoroacetabular impingement (FAI), labral and chondral damage, ligamentum teres injuries, sub-spinous impingement, and extra-articular hip pathology amongst others. The concept of hip arthroscopy was first introduced by Dr. Michael Burman in 1931 and has since has seen significant advancements in technology and understanding of hip pathology [4, 18]. The benefits of hip arthroscopy over traditional open surgery include a quicker recovery time and reduced risk of infection [12].

The list of indications for hip preservation procedures as a whole is ever expanding, and includes FAI, hip dysplasia, labral tears, chondral lesions, avascular necrosis, Perthes disease, slipped capital femoral epiphysis (SCFE), and even extra-articular pathologies, such as snapping hip syndromes. The majority of hip conditions that could benefit from hip preservation develop in childhood and adolescence [13]. Certain conditions, such as hip dysplasia, can be diagnosed at an early age via screening, but others, like FAI, may remain undiagnosed until adulthood.

FAI is a syndrome in which morphological abnormalities in the acetabulum and/or femoral head-neck junction result in abnormal contact between these two components during hip movement. This biomechanical conflict can cause hip pain in young adults and can lead to damage of the labrachondral junction and eventually the development of osteoarthritis (OA) over time in some [29]. Professor Ganz and colleagues in Switzerland were pioneers in the modern hip preservation movement, when they first described the association of FAI with OA in 2003 [8].

Since then, hip preservation procedures have gained immense recognition and their use has skyrocketed. Despite favourable short-term and intermediate-term clinical results in individual surgeon series and the Non-Arthroplasty Hip Registry (NAHR) data, there is limited evidence on long-term functional outcomes and failure rates beyond the 10-year mark [3, 20, 27]. However, a recent 10-year follow-up study by Vahedi et al. found that symptomatic FAI patients who underwent hip preservation surgery experienced significant long-term functional improvement and relief from symptoms [19, 26, 28]. Rates of conversion to total hip arthroplasty (THA) range from 8 to 10%, with a mean time to conversion of between 2 and 5 years post-arthroscopy [19, 26, 28]. It is important to note that certain factors have been identified as risk factors for treatment failure, defined as the need for conversion to THA, including

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a prolonged pre-operative symptomatic period, joint space narrowing, older age, and the presence of borderline hip dysplasia or full-thickness chondral lesions amongst others [28].

The evolution of hip preservation and hip arthroscopy

Hip preservation procedures continue to grow in popularity, as is evidenced by the literature. In England, the number of arthroscopic hip procedures performed increased by 727% between 2002 and 2013, a trend that is projected to continue to increase by nearly 1400% by the end of 2023 [23]. However, a decrease in the rate of hip arthroscopies was seen in Finland from 2013 to 2016, declining by 53% [15]. On a global scale, hip arthroscopy procedures have seen a positive trend, with an 18-fold increase in the United States (US) between 1999 and 2009, and a 2-fold increase in Korea between 2007 and 2010 [23]. The incidence of FAI, a common indication for hip arthroscopy, was found to follow a similar trend [9]. This trend can perhaps be attributed to a growing understanding and diagnosis of hip pathologies and improved clinician training over time. Concomitant with these increases in the use of hip preservation surgery, there has been a rapid increase in the volume of related data and literature. A hip arthroscopy registry was commenced by a Scandinavian expert group in 2011 [25], and the following year the NAHR was founded in the United Kingdom (UK) [11]. There has been a dramatic increase in the number of publications on topics related to hip preservation surgery, though the quality of these studies continues to be low, with the majority of studies providing Level IV evidence [16].

Patient demographics

Among 11,329 HA procedures performed in National Health Service hospitals in the UK between 2003 and 2013, females represented 60% of all patients. Apart from that, it has been observed that the age of patients undergoing hip arthroscopy has been decreasing in both females and males, with the greatest increase in rate in 20–24 year-old patients [23]. These findings are consistent with multiple studies exploring incidence of FAI across the world, showing higher incidence of FAI diagnosis in females than males [9]. Interestingly, further studies have shown that FAI morphology is more common in asymptomatic males than asymptomatic females; however, this trend seems to be reversed for symptomatic patients, with higher incidence in females [9, 14]. Recent published data from the NAHR also reveals some important findings. Amongst patients undergoing hip arthroscopy for FAI, there is significant improvement of patient-reported outcomes (PROMs) at 6 and 12 months post-operatively compared to baseline. Pre-operatively, and at 12 months post-operatively, PROMs were significantly lower in patients with pincer morphology compared to cam and mixed types [11].

Hip preservation training

Despite the rapid growth of hip preservation as a subspecialty in orthopaedic surgery, well-established training programmes and career pathways are still limited. The path to becoming a hip preservation specialist requires several stages of training, including core surgical training, higher surgical training, and fellowship training. Sports medicine is the most common fellowship pursued by orthopaedic surgeons to gain experience in hip preservation procedures. In the US, the number of dedicated hip preservation fellowships has increased, including programs at top institutions such as Boston Children's Hospital, Duke University, and Hospital for Special Surgery [5]. There are also eight hip preservation fellowships listed on the International Society for Hip Preservation (ISHA) website, including two in the UK [1]. Many surgeons in the US gain experience in hip preservation by obtaining dedicated training after completing a fellowship in reconstruction, sports medicine, trauma, or paediatrics [5]. The increase in the number of hip preservation fellowships may reflect the increased demand for such training. However, there is no widespread agreement on the ideal length, curriculum, and content of hip preservation fellowship training programme [24].

The learning curve associated with hip preservation is long and demanding, and caution should be exercised when deciding on how and when to adopt hip preservation into an orthopaedic surgeon's practice. Dumont and colleagues have demonstrated that as a surgeon gains experience through the learning curve, there is a significant reduction in both operating room and surgical time. However, this trend is only observed after a surgeon has performed their first 75 cases [7]. Similarly, Mehta and colleagues conducted a study of 251 surgeons and found that the frequency of subsequent hip surgeries was highest among surgeons who had performed only their first 97 cases, at 15.4%. As the surgeons progressed through the learning curve, the frequency of additional surgeries decreased, with only 2.6% of cases requiring additional surgery among surgeons who had performed more than 519 cases in their career [21]. Nonetheless, overall complication rates are low at about 3%, with only 0.2% of patients suffering major complications [22]. The most common complications are nerve injury (pudendal or lateral femoral cutaneous being most common), and iatrogenic chondral or labral injury.

There are several challenges in this minimally invasive surgical technique, including limited field of vison, reduced

degree of freedom of instrument manoeuvring and integration of 2D information into 3D, which increases the learning difficulty. Simulation-based training in hip arthroscopy has emerged as an important tool in the education and training of surgeons. This type of training allows surgeons to practice and perfect their techniques in a controlled and safe environment, which could potentially reduce the risk of complications during actual surgery and increase the efficiency. There is a growing body of evidence that demonstrates the benefits of virtual reality (VR) simulation in improving operating theatre performance, particularly in knee and shoulder arthroscopy [2]. However, more evidence is needed to support the use of VR in other orthopaedic surgeries and to assess the cost-effectiveness of VR simulators. It is important to note that resource availability, such as in more austere settings, can impact the opportunities for simulation-based training. In these settings, access to simulation equipment and facilities may be limited, and funding for training may also be scarce. This can make it difficult for surgeons to receive the necessary training and experience to perform complex procedures like hip arthroscopy. This highlights the importance of leveraging global networks and advances in technology to ensure educational and training opportunities are available to hip preservation surgeons around the world.

It is important to consider the history and structure of surgical training when thinking about how to best prepare future hip preservation surgeons. Over the past few decades, surgical training programs have seen a reduction in working hours for trainees, in response to the strenuous demands and work-life balance difficulties associated with traditional surgical training [22]. For example, the European Working Time Directive (EWTD) has reduced total training time for a surgical consultant (attending) from 30,000 to 6000 h [6]. In addition, surgical training is designed to train surgeons competent in their broad specialty (i.e. orthopaedics), but not experts in any subspecialty. These facts, combined with the general lack of exposure to hip arthroscopy in many training programs, places a focus on carefully planned and structured fellowship training as the main opportunity for many hip preservation surgeons to hone their technical skills. As mentioned above, simulation training offers an opportunity to accelerate and augment this learning. The British Orthopaedic Association's Trauma & Orthopaedics curriculum now includes three main approaches to simulation training: anatomy lab and dry simulation training (e.g. sawbones), wet lab simulation (e.g. cadaveric training), and 'simulated scenarios'. Virtual reality simulators have been validated for arthroscopy, and represent an evolving, relatively low cost, opportunity for added training time in what has the potential to be a high fidelity environment, including haptic feedback, and the ability for multiple individuals (trainees and/or instructors) to be in the same environment regardless of their physical location [17].

The ideal training programme in hip preservation, therefore, should include a period of a focussed hip preservation fellowship, cadaveric skills training coupled with simulator (high and low fidelity training), followed by mentored independent practice once the individual has commenced as a consultant or attending surgeon. Our group has previously published our vision for comprehensive training of young adult hip surgeons, including our experience with the Cambridge Hip Course, a combination of virtual reality and cadaveric simulation with expert mentors to help guide trainees through the various tasks [17]. Societies such as the European Society of Sports Traumatology, Knee Surgery, and Arthroscopy (ESSKA), the International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine (ISAKOS), ISHA, the American Orthopaedic Society for Sports Medicine (AOSSM), and the British Hip Society (BHS) also offer the opportunity of Travelling Fellowships which allow visits to Key Opinion Leaders in the field refining one's skills and picking up tips and tricks to improve surgical technique. Finally, the importance of ideal patient selection and nuances in surgical technique cannot be underestimated.

Future perspectives of hip preservation

As discussed, hip preservation has experienced rapid growth in popularity over the last 2 decades. The applications and methods of hip preservation procedures are expanding and will continue to grow. Progressing technological advancements and the use of artificial intelligence in medicine are likely to influence the hip preservation growth trajectory. Computer-assisted surgeries allow surgeons not only to create a precise pre-operative plan, but also increase accuracy of their implementation during surgery via complex navigation/robotic systems [30]. Likewise, the ability to predict individual patient outcomes using artificial intelligence and patient stratification preoperatively leading to personalised medicine holds great promise [10].

Data availability This study does not contain any primary data and thus data availability is not relevant. All cited sources and content are available online.

References

1. International Society for Hip Preservation (ISHA), Fellowships and Awards (2023). https://ishasoc.net/information-for-surgeons/training-education/fellowships-and-awards/. Accessed 25 Jan 2023
2. Bartlett JD, Lawrence JE, Stewart ME, Nakano N, Khanduja V (2018) Does virtual reality simulation have a role in training

trauma and orthopaedic surgeons? Bone Jt J 100(5):559–565. https://doi.org/10.1302/0301-620X.100B5.BJJ-2017-1439
3. Boyer T, Dorfmann H (2008) Arthroscopy in primary synovial chondromatosis of the hip: description and outcome of treatment. J Bone Jt Surg Br 90(3):314–318. https://doi.org/10.1302/0301-620X.90B3.19664
4. Burman MS (1931) Arthroscopy or the direct visualization of joints: an experimental cadaver study. J Bone Jt Surg 13(4):669–695
5. Chen AW, Steffes MJ, Laseter JR, Maldonado DR, Ortiz-Declet V, Perets I, Domb BG (2018) The education and training of future hip preservation surgeons: aggregate recommendations of high-volume surgeons. J Hip Preserv Surg 5(3):307–311. https://doi.org/10.1093/jhps/hny032
6. Chikwe J, de Souza AC, Pepper JR (2004) No time to train the surgeons. BMJ 328(7437):418–419. https://doi.org/10.1136/bmj.328.7437.418
7. Dumont GD, Cohn RM, Gross MM, Menge TJ, Battle NC, Thier ZT (2020) The learning curve in hip arthroscopy: effect on surgical times in a single-surgeon cohort. Arthroscopy 36(5):1293–1298. https://doi.org/10.1016/j.arthro.2019.11.121
8. Ganz R, Parvizi J, Beck M, Leunig M, Nötzli H, Siebenrock KA (2003) Femoroacetabular impingement: a cause for osteoarthritis of the hip. Clin Orthop Relat Res 417:112–120. https://doi.org/10.1097/01.blo.0000096804.78689.c2
9. Hale RF, Melugin HP, Zhou J, LaPrade MD, Bernard C, Leland D, Levy BA, Krych AJ (2021) Incidence of femoroacetabular impingement and surgical management trends over time. Am J Sports Med 49(1):35–41. https://doi.org/10.1177/0363546520970914
10. Harris JD (2021) Editorial commentary: personalized hip arthroscopy outcome prediction using machine learning-the future is here. Arthroscopy 37(5):1498–1502. https://doi.org/10.1016/j.arthro.2021.02.032
11. Holleyman R, Sohatee MA, Lyman S, Malviya A, Khanduja V, NAHR User Group (2023) Hip arthroscopy for femoroacetabular impingement is associated with significant improvement in early patient reported outcomes: analysis of 4963 cases from the UK non-arthroplasty registry (NAHR) dataset. Knee Surg Sports Traumatol Arthrosc 31(1):58–69. https://doi.org/10.1007/s00167-022-07042-y
12. Imam S, Khanduja V (2011) Current concepts in the diagnosis and management of femoroacetabular impingement. Int Orthop 35(10):1427–1435. https://doi.org/10.1007/s00264-011-1278-7
13. Jayakumar P, Ramachandran M, Youm T, Achan P (2012) Arthroscopy of the hip for paediatric and adolescent disorders: current concepts. J Bone Jt Surg Br 94(3):290–296. https://doi.org/10.1302/0301-620X.94B3.26957
14. Jung KA, Restrepo C, Hellman M, AbdelSalam H, Morrison W, Parvizi J (2011) The prevalence of cam-type femoroacetabular deformity in asymptomatic adults. J Bone Jt Surg Br 93(10):1303–1307. https://doi.org/10.1302/0301-620X.93B10.26433
15. Karelson MC, Jokihaara J, Launonen AP, Huttunen T, Mattila VM (2021) Lower nationwide rates of arthroscopic procedures in 2016 compared with 1997 (634925 total arthroscopic procedures): has the tide turned? Br J Sports Med 55(18):1018–1023. https://doi.org/10.1136/bjsports-2019-101844
16. Khan M, Oduwole KO, Razdan P, Phillips M, Ekhtiari S, Horner NS, Samuelsson K, Ayeni OR (2016) Sources and quality of literature addressing femoroacetabular impingement: a scoping review 2011–2015. Curr Rev Musculoskelet Med 9(4):396–401. https://doi.org/10.1007/s12178-016-9364-5
17. Kumar KHS, Lawrence JE, Khanduja V (2016) Training young adult hip surgeons for the future: the Cambridge vision. Bone Jt 360 5(6):8–12. https://doi.org/10.1302/2048-0105.56.360485
18. Magrill ACL, Nakano N, Khanduja V (2017) Historical review of arthroscopic surgery of the hip. Int Orthop 41(10):1983–1994. https://doi.org/10.1007/s00264-017-3454-x
19. Malviya A, Raza A, Jameson S, James P, Reed MR, Partington PF (2015) Complications and survival analyses of hip arthroscopies performed in the national health service in England: a review of 6,395 cases. Arthroscopy 31(5):836–842. https://doi.org/10.1016/j.arthro.2014.12.013
20. McCarthy JC, Jarrett BT, Ojeifo O, Lee JA, Bragdon CR (2011) What factors influence long-term survivorship after hip arthroscopy? Clin Orthop Relat Res 469(2):362–371. https://doi.org/10.1007/s11999-010-1559-2
21. Mehta N, Chamberlin P, Marx RG, Hidaka C, Ge Y, Nawabi DH, Lyman S (2018) Defining the learning curve for hip arthroscopy: a threshold analysis of the volume-outcomes relationship. Am J Sports Med 46(6):1284–1293. https://doi.org/10.1177/0363546517749219
22. Nakano N, Lisenda L, Jones TL, Loveday DT, Khanduja V (2017) Complications following arthroscopic surgery of the hip: a systematic review of 36 761 cases. Bone Jt J 99-B(12):1577–1583. https://doi.org/10.1302/0301-620X.99B12.BJJ-2017-0043.R2
23. Palmer AJ, Malak TT, Broomfield J, Holton J, Majkowski L, Thomas GE, Taylor A, Andrade AJ, Collins G, Watson K, Carr AJ, Glyn-Jones S (2016) Past and projected temporal trends in arthroscopic hip surgery in England between 2002 and 2013. BMJ Open Sport Exerc Med 2(1):e000082. https://doi.org/10.1136/bmjsem-2015-000082
24. Peters CL, Beaulé PE, Beck M, Tannast M, Jiranek W, Sierra RJ (2012) Report of breakout session: strategies to improve hip preservation training. Clin Orthop Relat Res 470(12):3467–3469. https://doi.org/10.1007/s11999-012-2449-6
25. Sansone M, Ahldén M, Jonasson P, Thomeé C, Swärd L, Baranto A, Karlsson J, Thomeé R (2014) A Swedish hip arthroscopy registry: demographics and development. Knee Surg Sports Traumatol Arthrosc 22(4):774–780. https://doi.org/10.1007/s00167-014-2840-9
26. Sohatee MA, Ali M, Khanduja V, Malviya A (2020) Does hip preservation surgery prevent arthroplasty? Quantifying the rate of conversion to arthroplasty following hip preservation surgery. J Hip Preserv Surg 7(2):168–182. https://doi.org/10.1093/jhps/hnaa022
27. Steppacher SD, Huemmer C, Schwab JM, Tannast M, Siebenrock KA (2014) Surgical hip dislocation for treatment of femoroacetabular impingement: factors predicting 5-year survivorship. Clin Orthop Relat Res 472(1):337–348. https://doi.org/10.1007/s11999-013-3268-0
28. Vahedi H, Yacovelli S, Diaz C, Parvizi J (2021) Surgical treatment of femoroacetabular impingement: minimum 10-year outcome and risk factors for failure. JB JS Open Access. 6(4):e20.00176. https://doi.org/10.2106/JBJS.OA.20.00176
29. Wenger DR, Kishan S, Pring ME (2006) Impingement and childhood hip disease. J Pediatr Orthop B 15(4):233–243. https://doi.org/10.1097/01202412-200607000-00001
30. Zhang J, Pettit M, Sunil Kumar K, Khanduja V (2020) Recent advances and future trends in hip arthroscopy. J Arthrosc Surg Sport Med 1(1):81–89. https://doi.org/10.25259/JASSM_24_2020