Marlex-mesh reconstruction should be considered in extensor mechanism deficient patients undergoing two-stage exchange arthroplasty for PJI.

Failure after modern total knee arthroplasty: a prospective study of 18 065 knees

As reported in this issue of *360*, the number of total knee arthroplasties (TKAs) per year is projected to reach three million in the United States by 2030. With the predicted increase in primary TKAs performed, this will inevitably lead to an increase in TKA failures and subsequent revisions. The main reasons identified for TKA failure include infection, aseptic loosening, instability, polyethylene wear, stiffness, and patellofemoral complications. Unfortunately, this data is drawn from large registry databases that often do not account for incomplete patient follow-up and have relatively low data fidelity. The authors of this paper from **New York, New York (USA)** have used a large single-institution database that prospectively collected demographic and clinical data for patients who underwent primary TKA during a five-year period from May 2007 to December 2012.[8] The authors of this paper describe a total of 18 065 primary TKAs in 16 083 patients. A total of 405 knees (2.24% revision rate) in 400 patients went on to fail and require implant revision surgery. Over 85% of the revisions described were attributed to infection, instability, aseptic loosening, or stiffness. Factors that increased the risk for TKA revision included a younger age, a history of drug abuse, use of a constrained design, bilateral primary TKAs, and an original diagnosis of post-traumatic osteoarthritis. Interestingly, commonly indicated risks like body mass index, gender, or Charlson Comorbidity Index were not related to risk for failure in this study. It has become clear that reasons for revision TKA are changing. Historically, device-related failure due to polyethylene wear and osteolysis were much more common. It appears that modern improvements in material processing and sterilization have successfully reduced these complications and, as described by this series and others, infection is moving to the forefront. Our focus must turn to mitigating infection risk, as this is one of the most devastating indications for revision TKA.

Revision total knee arthroplasty for prosthetic joint infection

Prosthetic joint infection (PJI) following total knee arthroplasty (TKA) is an extremely challenging clinical scenario. Revision TKA, whatever the indication is known to be, is associated with increased short-term complications over primary TKA, such as urinary tract infection, respiratory failure, and re-admission. However, the short-term complications specifically associated with TKA revisions for PJI are not well-described. Authors of this paper from **New York, New York (USA)** utilized data from the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database to determine short-term complications and re-admission rates for revision TKA for PJI, relative to primary TKA, and revision TKA for all other indications.[9] A total of 162 981 patients formed the population for this study and they all underwent a primary TKA. A further 10 584 underwent revision TKA for all non-PJI indications, and 2196 underwent revision TKA for PJI. The overall complication rate was nearly double for all revision TKAs (both non-PJI and PJI) compared with primary TKAs, and the complication rate for revision TKAs for PJI was almost triple the rate for non-PJI revisions. Patients undergoing revision for PJI were at increased risk of any complication, death, respiratory complications, renal complications, sepsis, deep surgical site infection, blood transfusions, non-home discharge, and hospital re-admissions relative to non-PJI revisions. Operative time and postoperative length of stay (LOS) was also significantly longer for PJI revisions than non-PJI revisions (+3.7 minutes; +2.1 days). Results of this study confirm the increased risk of complications for all revision TKAs, but also highlight the substantial risks specific to revision TKAs for PJI.

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Sports

Hip arthroscopy outcomes and return to play or duty

There has been a renewed interest in outcomes and return to play following hip arthroscopy, particularly after treatment of femoroacetabular impingement (FAI), and this is only set to continue with the publication of the first large randomized trial demonstrating improved outcomes from **Coventry (UK)**.[1] The authors highlight improved outcome *versus* physiotherapy in terms of functional outcomes, and several more trials are due to report shortly. The findings of the FASHION study are at odds with a recent randomized controlled trial that demonstrated similar outcomes in patients undergoing arthroscopy compared with those treated with physical therapy alone. These investigators from **Texas (USA)** screened 104 eligible patients, 80 of whom went on to participate in the study.[2] This study focused on highly active patients with over 90% current active duty military personnel. Patients all had

femoroacetabular impingement and were randomly allocated to either surgery or a 12-session supervised clinic programme within three weeks. Those in the surgery group did not receive their intervention for an average of four months and patient-reported outcome measures (Hip Outcome Score) over a two-year period were collected. In similar findings to the FASHION study, both groups reported statistically significant improvements over the two-year follow-up. However, there was no significant difference at two years. As hip arthroscopy continues to grow in popularity, this investigation caused significant discussion of implications and limitations, which were addressed by the authors in a recent letter.[3] While the authors acknowledge significant crossover between groups, inadequate power, small improvements in all patient-reported outcomes, and a minimum two-year follow-up, it is clear that controversy remains in effectiveness and return to play or duty. There have been a significant number of recent investigations and reviews addressing clinical improvement and return to play or duty following hip arthroscopy.

Return to sport after hip arthroscopy for FAI in 18- to 30-year-old athletes

■ Sticking with the world of hip arthroscopy, our next pair of papers build on the evidence to support rates of return to sport, which were recently reported as 87% after arthroscopic surgery for femoroacetabular impingement (FAI) in a systematic review from **Zurich (Switzerland)**.[4] The authors of the review, however, noted that the level of return is less clear. Investigators from **Amager-Hvidovre (Denmark)** sought to fill in the gaps identified by this systematic review and determine whether athletes undergoing surgery for FAI returned to the same sport at the same level.[5] The authors performed a cross-sectional study of 189 athletes using the Danish Hip Arthroscopy Registry, which collects self-reported Copenhagen Hip and Groin Outcome Scores (HAGOS) and data acquired from a return-to-play (RTP) questionnaire. Depending on how patients reported on their participation in their pre-injury sport and pre-injury level, they were classified as either full participant, impaired performance but full participant, or impaired performance with restricted participation. Patients were active and, on average, young adults (mean age 27 years) with registry-based follow-up just short of three years. By the latest reported follow-up, just over half of the athletes (57%) were playing the same sport at the same level as before surgery. Of those playing the same sport at the same level, around a third reported full participation, which equates to just 16.9% of the entire cohort. This is considerably lower than the RTP rates published elsewhere in the literature, and may represent the use of more strict definitions of RTP and clearer definition of the level of performance upon return. This investigation was performed using a registry, and is therefore subject to limitations associated with registry-based research. Although the HAGOS has been validated, the RTP questionnaire used was specific to this investigation, limiting any interpretation beyond the RTP options presented. The study does, however, demonstrate that only 16.9% of the large cohort of returned to full sports participation at the preoperative level. Although the cohort contains athletes from elite to recreational, which may influence their motivation to return to their previous level of competition, there is certainly some food for thought here. Perhaps, when looked at objectively, the outcomes are not as good as currently thought.

Return to high intensity interval training after hip arthroscopy for FAI

■ Sticking with the theme of return to normal sporting activity, we were delighted to see this paper from **Chicago, Illinois (USA)**, which paid specific attention to the ability of high intensity interval training (HIIT) athletes to return to these activities following hip arthroscopy for femoroacetabular impingement (FAI).[6] These activities, also referred to by some as 'CrossFit', have grown in popularity, but some literature reports high injury rates among participants. Consequently, there are growing numbers of athletes seeking attention for labral tears and FAI symptoms. This paper reports a consecutive series of patients undergoing arthroscopic treatment for FAI, who were self-identifying as HIIT participants. All patients were treated by the same surgeon and evaluated postoperatively with a comprehensive array of subjective outcomes scores (modified Harris Hip Score; Hip Outcome Score Activities of Daily Living; Hip Outcome Score Sports Specific Subscale; visual analogue scale for pain; and a HIIT-specific questionnaire). The series consists of 32 patients (13 male, 19 female) with an average age of 35 years and a minimum 24 months of follow-up. Of these patients, 22 participated in 'CrossFit', with the others involved with various other forms of HIIT. Preoperatively, 14 of these patients had stopped HIIT due to hip symptoms, and 14 had scaled back their participation. Postoperatively, 88% returned to HIIT activity at a mean of 9.8 months (SD 5.7) from surgery, with 96% returning to the same or better level. All patients demonstrated improvement in subjective outcomes scores, and fear of re-injury was the most common reason not to return to HIIT. Although it is a group activity in many cases, HIIT training is usually a self-directed recreational activity. Due to this, the classification of return to full activity is highly subjective, as it is conceivable that patients can return to the same level of participation, but not perform at the same quality or intensity, and, if symptomatic, would likely avoid problematic movements or activities. There is also no control group to compare with the surgical patients, and this method is subject to recall bias. The authors stated that the main reason not to return was psychological rather than physical. Taken together, these concerns raise questions about the high rate of return to HIIT in this investigation.

Outcomes of hip arthroscopy in the first year and time required to achieve minimal clinically important difference or substantial clinical benefit

■ With the wider use of hip arthroscopy, the research surrounding it, as well as the surgery itself, has gained maturity. In particular, the assessment of outcomes has become more robust, with the Copenhagen Hip and Groin Outcome Score (HAGOS) maturing into a validated score. Investigators in **Copenhagen (Denmark)** sought to evaluate the clinical outcomes of patients undergoing hip arthroscopy for femoroacetabular impingement (FAI) and/or labral injury using this now-validated score.[7] The authors applied the score within the first year and compared results with the modified Harris Hip Score (mHHS). Additionally, they determined how many of these patients met the minimal clinically important difference threshold (MICD) during the period of the study, and compared the results with those from healthy controls. Overall, 97 consecutive patients (56 female, mean age 38 years; 41 male, mean age 37 years) were compared with 158 age- and gender-matched controls, with both scores being applied. While improvements in all HAGOS subscales and mHHS were seen as soon as three months in the intervention group, these were not sustained at 12 months of follow-up, as improvements were seen in only two HAGOS subscales that assessed sports participation and physical activity. Overall, only 38% and 36% achieved MICD for HAGOS

and mHHS, respectively, within the first year. The authors conclude that patients cannot expect to achieve the functional level of healthy controls within one year from surgery. In a similar investigation that also looks to establish the time course of improvements in scores following arthroscopic treatment of FAI, surgeons in **New York, New York (USA)** investigated the time dependence of MICD and substantial clinical benefit (SCB) after hip arthroscopy for FAI retrospectively using institutional hip arthroscopy registry data.[8] Data collected as part of this study included mHHS, Hip Outcome Score, and International Hip Outcome Tool (iHOT-33) for up to two years postoperatively. Data from 719 patients (52.9% female) with a mean age of 32.5 years (SD 10.5) demonstrated that the highest probability of achieving MICD and SCB was at six months after surgery. The authors established that patients continued to improve up to two years following recruitment, with 93.6% achieving the MICD and 71.7% achieving the SCB on the iHOT-33. Similar trends were seen with other outcome measures. Older males, patients with an Outerbridge classification of 1 or greater, and patients with high preoperative scores were at increased risk of taking longer to achieve MICD and SCB. These two investigations, although retrospective and of limited duration, demonstrate that few patients achieve significant improvement early in their postoperative course, and that improvements in subjective outcomes can take at least two years. Patients who are young, female, and without cartilage defects are likely to see the fastest clinical improvement. These results suggest that while there may be small benefits to hip arthroscopy seen in a general sense (perhaps comparable to physical therapy alone), there may be specific groups of patients who have great benefit early in their postoperative course. As stated previously, this may be because patient selection for hip arthroscopy has not been refined sufficiently, and because those who stand to benefit most remain difficult for the surgeon to identify.

Systematic reviews of hip arthroscopy for FAI and return to play *versus* return to duty in the military

In a systematic review and meta-analysis, authors from **New York, New York (USA)** set out to assess what the current evidence says about the rate and duration of return to play (RTP) following hip arthroscopy, and to determine whether there is sufficient literature to support a protocol or functional assessment to assist in this outcome.[9] The review team used data reported from a total of 1296 patients, although, perhaps surprisingly, 54.5% of studies did not provide any RTP guidelines. Suggestions of three and four months were made by 36.4% and 9.1% of studies, respectively. The most common rehabilitation protocols gave weight-bearing guidelines and passive range of movement exercises. Only two studies gave sufficient RTP guidelines to be useful, and three provided a specific test. Mean reported RTP was 7.4 months overall, and the RTP percentage was 84.6% at a mean of 25.8 months (SD 2.4). Subjective scores demonstrated improvement from averages of 63.1 to 84.1 in the modified Harris Hip Score (mHHS) and 61.7 to 86.8 in Non-Arthritic Hip Score, with lower preoperative mHHS significantly associated with increased postoperative improvement. Overall, RTP protocols show little consensus or standardization, and the majority of rehabilitation protocols are not evidence-based, relying instead on surgeon preference. There is currently no validated RTP test for hip arthroscopy. In a related systematic review from **North Carolina (USA)**, the authors determined the proportion of return to duty (RTD) among active duty service members in the military following hip arthroscopy for femoroacetabular impingement (FAI).[10] A total of five studies including 884 service members demonstrated a RTD ranging from 57 to 84%, with only 39% being without limitation, at a mean follow-up of 33.2 months (SD 11.3). Only a single study reported a RTD timeframe, at a mean of five months. Most common procedures performed in this study were femoroplasty (in 56%) and acetabuloplasty (in 55%). Complication rates and failures were reported at 9.4% (SD 6.3) in two studies and 7.2% (SD 4.7) in three studies, respectively. RTD is poorly defined and highly variable, but about 75% of service members remain on active duty for one to two years following hip arthroscopy for FAI. However, only 47% of these do so without limitation at midterm follow-up, with continued pain and functional limitations. These represent some of the first systematic reviews of RTP and RTD and, due to the limited quality of investigations in this area (level 3 and 4 studies), it is difficult to draw conclusions. Heterogeneity in patients and outcomes also contributes to this challenge, as with all systematic reviews. Despite variability in RTP and RTD requirements, it is again clear from these studies that while a significant proportion of patients do return to play, it is unclear whether this represents a return to the same level or just a return to participation with limitation when compared with before injury. Return-to-duty requirements are also highly variable depending on the role of military personnel, and while 75% were able to remain on active duty, less than half did so without limitation. Taken together, this recent group of publications on outcomes after hip arthroscopy for FAI demonstrate that while there is seemingly overall improvement in patient symptoms, this can take at least two years and improvements may be modest. The question of effectiveness compared with physical therapy alone remains controversial. Some evidence is presented to suggest there may be a subset of patients undergoing hip arthroscopy that improve quickly and significantly, and these may be the younger patients with less accumulation of degenerative changes. The process leading to a symptomatic hip from FAI is likely long-term and may not be completely reversible. Patients reaching the symptomatic stage no longer have a normal hip, and expectation may need to be adjusted to 'better' rather than 'normal' following surgery. Requirements for return to sport and duty are highly variable and must be individualized. As in many areas of surgery, the importance of patient selection and failing nonoperative treatment prior to surgical intervention may help clarify which patients stand to benefit from arthroscopic treatment for FAI.

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Foot & Ankle

X-ref ***For other Roundups in this issue that cross-reference with Foot & Ankle see: Hip & Pelvis Roundup 7; Trauma Roundups 1 & 5; Children's orthopaedics Roundup 8; Research Roundup 2.***

Gastrocnemius tightness - assessing the extent and prevalence

There has been a much-increased interest in the role of gastrocnemius tightness in the development of a variety of orthopaedic conditions, especially in the foot and ankle. However, when does gastrocnemius tightness become pathological, and how tight is tight? In this interesting paper from a group at **Stanmore (UK)** this was put to the test.[1] The prevalence of gastrocnemius tightness, along with the degree of tightness when present, was investigated in patients with foot and ankle conditions and compared with the normal population. The authors undertook a prospective case-matched series with the intention of ironing out how much of a role gastrocnemius tightness has in the evolution of foot and ankle pathology. A total of 297 controls and 97 patients with foot and ankle pathology were recruited into this study and the authors excluded patients or controls with equinus contracture, neurological deficit, and ankle or hind foot arthritis. Using the modified lunge test, each participant had dorsiflexion measurements taken using an inclinometer attached to the ankle along the long axis of the fibula. Measurements were taken of maximum dorsiflexion achievable without the heel lifting from the ground, with the knee fully extended and then with the knee flexed (> 20°) to relax the gastrocnemius muscle. The difference between these measurements was recorded as the gastrocnemius tightness. The authors undertook a pre-study power analysis to detect a 2° difference in gastrocnemius tightness between the groups and recruitment targets were met to achieve this, using a definition of "normal" for gastrocnemius tightness of between two standard deviations from the mean of the control group (0° to 13°). Overall, the authors report that 21.6% of patients in the foot and ankle pathology group had gastrocnemius tightness. When the group of patients with gastrocnemius tightness were subdivided into "forefoot pathology" or "other foot pathology", there was again significant difference found between the two groups (10.3° *vs* 6.9°). There was no significant difference between the other foot pathology group and the controls. Using this method of measurement, a gastrocnemius contracture > 13° appears to be abnormal. Patients with forefoot pathology have the highest prevalence of gastrocnemius tightness, whereas there is no evidence to support its presence in other conditions based on this study. Further studies on larger groups of patients with forefoot pathology would perhaps be helpful here in the future to tease out the finer details. One limitation of this study, of course, is its generalizability into orthopaedic practice. Few people have access to this method of measurement in the day-to-day clinical setting. However, a goniometer is suggested as a substitute by the authors, and has also been reported previously.

Should we fuse both ankles?

While ankle fusion takes some beating (just look at the comparative literature for arthroplasty and fusion!), many patients present with bilateral hind foot pathology and it is not entirely clear whether bilateral ankle fusion is as satisfactory an option for our patients as the unilateral procedure. Fusing both ankles is controversial, as the bilateral loss of motion is widely thought to result in a much more profound subsequent gait abnormality than a single fusion. However, as the authors of this study from **Nara (Japan)** point out, it is easy to jump to the obvious conclusion, and in this case the evidence from comparative studies is significantly lacking.[2] The authors therefore performed a retrospective review of patients in whom a bilateral or unilateral arthrodesis was performed. In their small series, ten patients who had undergone a bilateral ankle fusion were matched with ten unilateral ankle fusion cases. Minimum follow-up for all cases was two years and the authors report their outcomes primarily in the form of patient-reported outcome measures (PROMs; Japanese Society for Surgery of the Foot scale and Self-Administered Foot Evaluation Questionnaire) preoperatively and at final follow-up. When comparing the outcome scores, there was no significant difference between the two groups. Analyzing the sub groups of the scores revealed a lower score for the bilateral arthrodesis group in the "social functioning" category only, although this can hardly be considered robustly valid given the small number of cases and multiple domains in each score. There was no difference in the categories for pain, physical functioning in daily life, shoe wearing, and general health. Accepting the limited sample size of this study, the results are still encouraging and it may well be an acceptable option to fuse both ankles. Given the obvious limitations, this study should only really be considered hypothesis generating. However, it certainly has made us reflect here at *360* – bilateral ankle arthrodesis may not be as bad as generally feared.

What is the most effective treatment for Morton's neuroma?

The humble Morton's neuroma is not the focus of major randomized controlled trials (RCT), or indeed much in the way of attention in the academic press at all. However, it causes significant and painful problems for large numbers people every year, and is often recalcitrant to simple methods of treatment. Akin with many conditions for which there is no truly successful treatment, there are a wide variety of different treatments currently in regular clinical use and available for a painful Morton's neuroma. Nonoperative therapies include orthotics, footwear modification, infiltration with steroid or alcohol, and radiofrequency ablation. Surgical treatment usually involves neurectomy or neurolysis