

Metal-on-metal hip and activity

■ The metal-on-metal hip saga is far from over. Despite early reports of success being followed by concerns surrounding articular surface replacement (ASR) resurfacing, metal-on-metal hip resurfacing is probably correctly indicated. Birmingham Hip Resurfacing (BHR) continues to have acceptable survivorship. There is more data on BHR, but there are several other systems also in use. Although poorer than a traditional total hip arthroplasty, there are a number of indications for which mainstream surgeons and enthusiasts will use BHR preferentially. Sometimes, a patient needs a high-performance hip arthroplasty to allow them to continue a high level of physical activity. While there is a general consensus and some evidence to support the statement that higher levels of sporting and physical activity are possible with hip resurfacing, there is not much data on longevity implications for metal-on-metal resurfacing in the high-performance patient. This particular paper from **Los Angeles, California (USA)** reports on a large series of Conserve Plus hip resurfacings, and asks the question: is it safe to return to sports

following hip resurfacing?⁸ The results from this paper are drawn from a series of 1,033 consecutive hip resurfacings. The authors were able to include follow-up information from 77% of these (n = 806). They were, as would be expected, a younger series of patients, with a mean age of 52 years. Their mean body-mass index was 26 kg/m². Activities undertaken postoperatively were divided into 17 subgroups dependent on the physical characteristics of the activity. The authors also collated data on the frequency and intensity of the exercise. The findings of this study can be easily summarized: in this series, there were no differences seen in resurfacing longevity based on impact activity or activity levels.

REFERENCES

1. **Petrillo S, Marullo M, Corbella M, Perazzo P, Romagnoli S.** One-staged combined hip and knee arthroplasty: retrospective comparative study at mid-term follow-up. *J Orthop Surg Res.* 2019;14(1):301.
2. **Suksathien Y, Piyapromdee U, Tippimanchai T.** Cup alignment change after screw fixation in total hip arthroplasty. *Indian J Orthop.* 2019;53(5):618-621.

3. **Okike K, Udugwo UN, Isaac M, et al; FAITH Investigators.** Not All Garden-I and II Femoral Neck Fractures in the Elderly Should Be Fixed: Effect of Posterior Tilt on Rates of Subsequent Arthroplasty. *J Bone Joint Surg Am.* 2019;101(20):1852-1859.
4. **Senard O, Houselstein T, Crémieux AC.** Reasons for Litigation in Arthroplasty Infections and Lessons Learned. *J Bone Joint Surg Am.* 2019;101(20):1806-1811.
5. **Grammatopoulos G, Melkus G, Rakhra K, Beaulé PE.** Does Cartilage Degenerate in Asymptomatic Hips with Cam Morphology? *Clin Orthop Relat Res.* 2019;477(5):962-971
6. **Sköldenberg OG, Rysinska AD, Chammout G, et al.** A randomized double-blind noninferiority trial, evaluating migration of a cemented vitamin E-stabilized highly crosslinked component compared with a standard polyethylene component in reverse hybrid total hip arthroplasty. *Bone Joint J.* 2019;101-B(10):1192-1198.
7. **Lamb JN, Matharu GS, Redmond A, Judge A, West RM, Pandit HG.** Patient and implant survival following intraoperative periprosthetic femoral fractures during primary total hip arthroplasty: an analysis from the national joint registry for England, Wales, Northern Ireland and the Isle of Man. *Bone Joint J.* 2019;101-B(10):1199-1208.
8. **Amstutz HC, Le Duff MJ.** Effects of physical activity on long-term survivorship after metal-on-metal hip resurfacing arthroplasty: is it safe to return to sports? *Bone Joint J.* 2019;101-B(10):1186-1191.

Knee

X-ref For other Roundups in this issue that cross-reference with Knee see: **Hip & Pelvis Roundups 1 & 4; Sports Roundups 1 & 3; Research Roundups 3 & 4.**

Preoperative weight and total knee arthroplasty: how much is enough?

■ The perennial hot potato of weight and large joint arthroplasty is given a fresh look by surgeons in **Lebanon, New Hampshire (USA)**.¹ The vast majority of surgeons would agree that there is now ample evidence to suggest that weight loss improves pain in arthritic joints, reduces the risks of surgery, and may also improve implant longevity. In light of this, many arthroplasty surgeons will have their own protocols for managing patients with high body mass index (BMI), such as pre-surgery cut-offs, and others may adhere to those imposed by payers or hospitals. Considering the evidence, every arthroplasty surgeon who counsels obese patients should recommend weight loss prior to surgery. However, although we often tell patients to lose weight, until now, we have never as a profession had any information that indicates the exact amount that our patients need to lose. Taking a refreshingly realistic approach to the problem, the

research team tried to establish, in a cohort of morbidly obese patients (BMI \geq 40 kg/m²), the weight loss required to improve operative time, length of stay, discharge to a facility, and function as measured by the Patient-Reported Outcomes Measurement Information System (PROMIS). A cohort of 203 patients who were operated on over a five-year period at their tertiary referral centre, and who had a BMI of over 40 kg/m² at least 90 days preoperatively, were identified. The authors also had access to immediate preoperative patient BMI measurements. Adjusted analyses were undertaken for age, sex, year of procedure, laterality, comorbidity, and physical function to establish the optimum weight loss threshold in order to reduce operative complexity. In this cohort, 41% had lost 5 lbs or more prior to surgery. Losing 20 lbs was associated with a lower adjusted odds of discharge to a healthcare institution (odds ratio (OR) 0.28) and lower odds of extended stays of at least four days (OR 0.24). Differences in operative time were also observed. Interestingly, patients who instead lost 5 lbs or 10 lbs did not see these benefits. Now, using this study for reference, we can give patients a target weight loss of 20 lb, substantiated by well-supported data. This can provide better patient outcomes and give

patients a tangible goal with a known clinical benefit prior to undergoing arthroplasty.

Experienced surgeon or robot in unicompartmental knee arthroplasty?

■ Many surgeons and patients question the necessity and benefit of digitization and robots. In this day and age of technological advances, it is tempting to presume that machines can, and will, do better than their human counterparts. There have been a number of randomized, pseudorandomized, and cohort studies looking at both guided and robot-assisted surgery. However, this paper from **Fishers, Indiana (USA)** pits the accuracy of a single surgeon against the best published figures for robotic-assisted surgery.² While a slightly tricky paper to interpret – the authors have essentially performed a literature review to establish the published accuracy for component alignment by a robot and compared this with their single surgeon series – there are some interesting points made. A consecutive series of unicompartmental knee arthroplasties (UKAs), performed by a single surgeon with a fixed-bearing implant, underwent radiological analysis in order to establish the final component alignment. Alignment was measured

for 128 patients. The percentage of knees in which the postoperative measurements were within preoperative targets, and the root mean square (RMS) error rates between the planned and achieved targets, were reported. These were then compared with published robotic-assisted UKA data. A surprising finding was that the proportion of manual UKAs hitting the preoperative target was 66%, exceeding previously published values of robotic UKA (58%) and manual UKA (41%). Again, this was reflected in the reported RMS error for tibial component alignment (1.48°), lower than the published error for robotic UKAs (1.8° to 5°). A similar finding was recorded for tibial slope rates. However, these results do fall within the range that one might expect for an experienced surgeon. It is worth noting that this series clearly had an axe to grind and, with the added fallibility of subjective measurements, one can expect some reporting bias. Due to the lack of a comparator and unblinded study reporters, it is not clear whether these differences are within the error margin of radiological measurements, or whether the measurements were taken in the same way as those in other published series. The key takeaway here, we at 360 suggest, is that having a surgeon experienced in UKA is more important than the approach used. Certainly, this study proves that some surgeons can achieve a comparable, or even better, alignment to the best published robotic series, no matter which approach is used.

Femoral component sagittal positioning anterior knee pain

■ Anterior knee pain is not an uncommon complication following total knee arthroplasty (TKA). It can be very difficult to identify the cause, and pain management for many is even vaguer. In some series, anterior knee pain has been reported in over 80% of patients when rising out of a chair, and in 90% when ascending the stairs. Other series paint a rosier picture. There are many features of modern-day TKA implants that try to negate the risk of anterior knee pain from the patellofemoral joint. The single-radius concept is based around a common axis in both flexion and extension, ensuring a consistent relationship with the patellofemoral axis and the tibial longitudinal rotational axis. By posteriorizing the flexion-extension axis, the implant designers effectively lengthen the quadriceps moment arm, and so reduce the patellofemoral joint reaction force. Other design principles to facilitate the patellofemoral joint include specific right and left femoral components, deeper trochlear grooves, and improved patellar glide. However, a number of recent studies have suggested

that sagittal component alignment is more important. This study attempted to investigate sagittal femoral component position as a predictor of anterior knee pain at long-term follow-up after a cruciate-retaining single-radius TKA without routine patellofemoral resurfacing. The authors from **Edinburgh (UK)** included a total of 297 patients and reviewed patient records and radiographs.³ Of these, 73 had anterior knee pain (25%) at ten years. Interestingly, nine patients (four with anterior knee pain and five with no pain at ten years) had undergone a primary patellar resurfacing. One patient underwent a subsequent resurfacing, but this failed to relieve their anterior knee pain. In this cohort, early postoperative stiffness requiring a manipulation under anaesthetic was not associated with late anterior knee pain. There were 133 patients that had radiographs suitable for analysis. Patients with the femoral component flush with the distal femur were less likely to have anterior knee pain. However, flush femoral components were more likely to be flexed, and this flexion was associated with anterior knee pain. Femoral component oversizing was not associated with anterior knee pain. Nevertheless, those patients with an anterior femoral offset ratio $> 15\%$ of the femoral diameter were more likely to have anterior knee pain than those with an offset ratio $< 15\%$. Femoral component flexion, tibial component coronal alignment, and patella baja were independent predictors for anterior knee pain at ten years. Patients with anterior knee pain reported worse outcomes for moving into and out of a car, night pain, pain while shopping, and descending stairs. Managing anterior knee pain post-TKA and patellar resurfacing does not seem to be the answer, with over 60% of patients reporting persistent symptoms. Routine patellar resurfacing as part of the primary procedure also does not seem to be the answer. While this study did not include analysis of joint line restoration, coronal alignment, or component rotation, it did provide some useful pointers for attempts to reduce the incidence of anterior knee pain post-TKA. This information is particularly helpful for those who have an interest in TKA by robotic-assisted implantation surgery, and those undertaking revision for painful TKAs.

Cemented versus cementless total knee arthroplasty of the same modern design: a prospective, randomized trial

■ Fixation type in total knee arthroplasty (TKA) has not been given the same exposure as it has in total hip arthroplasty. While there are well-publicized series, big data analyses, and trials on the hip, there is precious little data that sheds light on the best option for the knee. The vast majority

of knee arthroplasties are cemented on both sides of the articulation. Yes, there are some successful cementless knee arthroplasties supported by good data, but they still remain a part of the small print in the orthopaedic literature. The common mechanism of aseptic failure in TKAs begins at the cement interface and often results in considerable bone loss. Due to this, surgeons and bioengineers continue to have an interest in cementless knee arthroplasties, and the technology has seen a great deal of ongoing development. Although there are few head-to-head comparisons, many of the modern implants seem to have appreciable benefits over the cemented alternatives. Here at 360, we were therefore delighted to see this prospective randomized controlled trial from **St. Louis, Missouri (USA)**, a head-to-head comparison of both techniques with two-year follow-up.⁴ Curiously, the authors set out to establish a clinical difference of five points on the Oxford Knee Score. The authors reported a power analysis of 130 patients at 90% power, which seems to be a surprisingly small number. Notwithstanding these concerns, the study does present valuable data, albeit with a short follow-up period. Patients with inflammatory arthritis, a body mass index > 40 kg/m², infections, neuromuscular disorders, osteoporotic bone, and bone defects were excluded. Once recruited, patients were randomly assigned to receive either a cemented or cementless cruciate-retaining TKA. The implants were of an identical design, bar the fixation method. On the cementless components, a highly porous fixation surface was utilized for bony ingrowth. Outcomes were primarily assessed with the Oxford Knee Scores. Secondary clinical outcomes were the Knee Society Score and Forgotten Joint Score. The authors described the outcomes of the 147 patients recruited to the study, of whom 141 were available for primary endpoint analysis. Crucially, there were no differences in the clinical outcomes at any timepoint inside the two-year-follow up period. The study was also unable to find any radiological evidence of component subsidence or loosening in either cohort. Due to the short follow-up and small sample size, the authors find it somewhat difficult to draw hard conclusions. However, a longer follow-up may provide more things to say. We at 360 commend the authors for adding some high-quality evidence to an otherwise scarce landscape.

The clinical and cost effectiveness of total versus partial knee arthroplasty: five-year outcomes of a randomized controlled trial

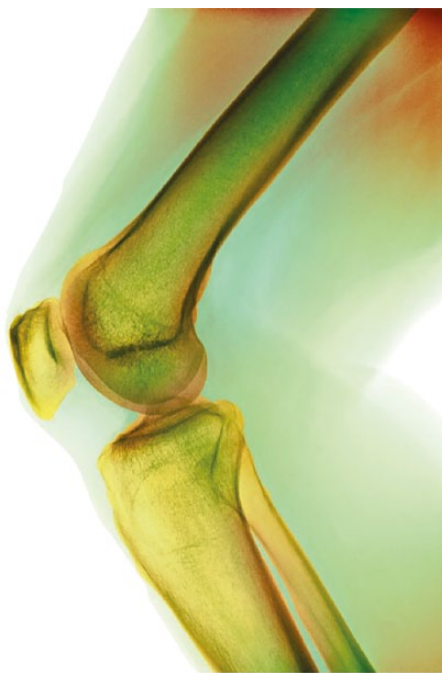
■ The Total or Partial Knee Arthroplasty Trial (TOP-KAT) study was a large randomized controlled trial

(RCT) investigating the best treatment for medial compartment osteoarthritis of the knee. This well-conducted, nationally funded study aimed to establish whether total knee arthroplasty (TKA) or partial knee arthroplasty (PKA) is superior. The study was exceptionally well-designed and well-run, powered for both clinical effectiveness and cost-effectiveness. This month, the five-year outcomes of the study were published in *The Lancet*. The investigators from **Oxford (UK)** finally completed this multicentre, pragmatic RCT that spanned 27 sites across the country.⁵ The author used a combination of expertise and equipoise-based approaches to ensure that the patients received their arthroplasty, either from surgeons willing to conduct the allocated treatment, or from surgeons willing to conduct both operations. The primary endpoint examined was the Oxford Knee Score (OKS) at five years post-randomization. The health-care costs (at UK 2017 prices) and cost-effectiveness were also reported. The study team assessed 962 patients for eligibility; 528 patients were recruited and randomly allocated to one of the treatment interventions. Follow-up rates at five years were an impressive 94%, and the authors found no difference in the OKS between groups. However, the study did report PKA as both more effective and less expensive than TKA. This finding was accounted for by a combination of a marginally improved effectiveness (0.24 additional quality-adjusted life-year) and a lower cost (£940 per patient). This valuable study argues that, on the basis of health economics, it is reasonable to choose PKA for a patient suitable for either intervention. That said, both interventions are, ultimately, clinically effective and cost-effective. It will be interesting to see how the cost-effectiveness stands up over the next five years. For patients that require revision, PKA may be cheaper and simpler.

A cost-effective robot: surely not?

■ Notwithstanding the avid criticism, evidence is accumulating that robotic-assisted unicompartmental knee arthroplasty (rUKA) offers improved clinical outcomes, offsetting the scant series and lack of robust data for Markov decision analysis. This team from **Edinburgh (UK)** did find enough data in the literature to answer the question: can rUKA be cost-effective?⁶ In order for Markov modelling to work, certain assumptions have to be made using published data on outcomes, complication rates, costs, and volumes. The authors of this study utilized their Markov model to evaluate the cost per quality-adjusted life-year (QALY) of rUKA relative to manual total knee arthroplasty (TKA) and UKA. The authors then went on to assess

the effects of case volumes and length of hospital stay on the analysis. The authors constructed their Markov decision analysis using previously published parameters for costs, outcomes, implant survival, and mortality. The patients selected had isolated medial compartment osteoarthritis and were a mean age of 65 years. Using a model with an index case volume of 100 patients per year, the cost per QALY of rUKA was £1,395 and £1,170 relative to TKA and UKA, respectively. This finding was sensitive to case volume and ranged from £7,170 to £648 (low-volume to high-volume) relative to TKA, and £8,604 to £574 relative to UKA. A reduction in costs came with the ability to achieve day-case surgery. Markov analysis does demonstrate that rUKA can be cost-effective, but only with large case volumes and shorter hospital stays. However, the analysis is compromised by the inherent weaknesses in the published data on which it was based. If rUKA is not clinically more effective or more robust in terms of longevity, then all bets are off.



Does partial meniscectomy lead to total knee arthroplasty?

■ Soft-tissue knee injuries are relatively common, and patients who undergo an open total meniscectomy are at high risk of a secondary total knee arthroplasty (TKA). However, there is a paucity of data surrounding the requirement for secondary TKAs following a soft-tissue conserving arthroscopic partial meniscectomy (APM). This big data study from **Oxford (UK)** looks at the rates of TKA post-APM over a 20-year period.⁷

The cohort examined was huge; 834,393 patients were included in this study. Analysis of hazard ratios was adjusted accordingly for patient age, sex, year of APM, Charlson Comorbidity Index, regional deprivation, rurality, and ethnicity. There were over 120,000 subjects with more than 15 years of follow-up data, and so these were used for the majority of the analyses. The headline was that of the APM patients with at least 15 years of follow-up, 13.49% (16,256/120,493) underwent a subsequent arthroplasty. Risk of arthroplasty was much higher in women (risk ratio 2.23). Relative to the general population, the cohort were over ten times more likely to require TKA, and this rose to almost 40 times more likely at a younger age. Even allowing for the limitations in study design and the relatively poor granularity of national-level data, it is difficult to ignore these findings. Given the large sample size, the authors were able to analyze the risk of arthroplasty in the affected versus the contralateral knee in patients with a history of APM in only one knee. The risk of arthroplasty in the affected knee was three times higher than in the contralateral knee. While this paper does not provide any answers, it does establish some facts. The rates of conversion to TKA are beyond reproach here, and the culprit mechanism is still elusive. Do meniscal tears themselves lead to arthritis? Is it a prearthritic problem? Is there something about the arthroscopy and/or meniscectomy that causes increasing rates of degeneration? These questions cannot be answered by one paper alone; however, this paper does do an amazing job of pointing out the scale of the problem.

'Inter-stage transfer' of revision knee patients

■ This interesting paper from **Toronto (Canada)** reports on a slightly unusual care plan: the transference of patients to a specialized arthroplasty centre between the first and second stages of two-stage revision total knee arthroplasty (TKA) for prosthetic joint infection (PJI).⁸ The paper details a retrospective case series of patients who either underwent both revision stages in their tertiary referral centre, or underwent the first stage in a satellite centre before being transferred for the second-stage procedure. The latter have been labelled as 'inter-stage transfers' by the authors. In total, their institutional database recorded 137 patients, of whom 32 were inter-stage. The cohorts were not well matched, with the single-centre cohort having higher organism virulence (36% vs 16%). However, overall, inter-stage patients had poorer outcomes: higher rates of persistent infection (54% vs 13%) and soft-tissue complications (31% vs 14%),

and lower rates of bone loss needing porous augments (78% vs 94%). There is an important, simple, and self-evident message put forward by this paper: if you are not going to do the second stage, do not do the first stage, as outcomes are much worse.

REFERENCES

1. Keeney BJ, Austin DC, Jevsevar DS. Preoperative weight loss for morbidly obese patients undergoing total knee arthroplasty: determining the necessary amount. *J Bone Joint Surg Am.* 2019;101(16):1440-1450
2. Bush AN, Ziemba-Davis M, Deckard ER, Meneghini RM. An experienced surgeon can meet or exceed robotic accuracy in

manual unicompartmental knee arthroplasty. *J Bone Joint Surg Am.* 2019;101(16):1479-1484.

3. Scott CEH, Clement ND, Yapp LZ, MacDonald DJ, Patton JT, Burnett R. Association between femoral component sagittal positioning and anterior knee pain in total knee arthroplasty: a 10-year case-control follow-up study of a cruciate-retaining single-radius design. *J Bone Joint Surg Am.* 2019;101(17):1575-1585.
4. Nam D, Lawrie CM, Salih R, Nahhas CR, Barrack RL, Nunley RM. Cemented versus cementless total knee arthroplasty of the same modern design: a prospective, randomized trial. *J Bone Joint Surg Am.* 2019;101(13):1185-1192.
5. Beard DJ, Davies LJ, Cook JA, et al. The clinical and cost-effectiveness of total versus partial knee replacement in patients with

medial compartment osteoarthritis (TOPKAT): 5-year outcomes of a randomised controlled trial. *Lancet.* 2019;394(10200):746-756.

6. Clement ND, Deehan DJ, Patton JT. Robot-assisted unicompartmental knee arthroplasty for patients with isolated medial compartment osteoarthritis is cost-effective: a markov decision analysis. *Bone Joint J* 2019;101-B:1063-1070.
7. Abram SGF, Judge A, Beard DJ, Carr AJ, Price AJ. Long-term rates of knee arthroplasty in a cohort of 834 393 patients with a history of arthroscopic partial meniscectomy. *Bone Joint J.* 2019;101-B:1071-1080.
8. Garceau S, Warschawski Y, Dahduli O, Alshaygy I, Wolfstadt J, Backstein D. The effect of patient institutional transfer during the interstage period of two-stage treatment for prosthetic knee infection. *Bone Joint J.* 2019;101-B(9):1087-1092.

Sports

X-ref For other Roundups in this issue that cross-reference with Sports see: *Hip & Pelvis Roundup 5; Foot & Ankle Roundup 3; Shoulder & Elbow Roundup 5.*

How common are complications after paediatric anterior cruciate ligament reconstruction? X-ref

■ The ongoing concern surrounding paediatric anterior cruciate ligament (ACL) injury lies with the treatment complications, leaving those involved between a rock and a hard place. On the one hand, having an unstable knee leaves a growing child susceptible to further injury, including meniscal tear, osteochondral defects, and instability. On the other hand, while reconstruction will reliably solve the instability problem, surgery to a growing physis has its own range of complications, such as growth arrest and deformity. In recent years, the pendulum has swung towards operative intervention and the current literature does seem to support this. However, as with many diagnoses, research is limited and drawing inferences from a single paper is fraught with risk. The way forwards is through evidence synthesis and, here at 360, we were delighted to see this meta-analysis of paediatric ACL from **San Francisco, California (USA)**, which aimed to nail down the expected and likely complications in terms of type and frequency.¹ As part of their search strategy and review, the authors screened 160 potentially suitable studies. Of these, 45 studies were primarily utilized in the meta-analysis and reported the outcomes of 1321 patients with 1392 knees. The goal of the review was to assess complications inherent in this age group. In the skeletally immature patient, potential growth disturbance and

rerupture are the two main concerns. The authors report that a growth disturbance (valgus, varus, or limb-length discrepancies) could occur with any type of reconstruction and include shortening, overgrowth, and angular (mostly valgus). Overall, there was a low rate of growth disturbances (4%, n = 58/1392, of whom 16 required corrective surgery). While angular deformity rates were low (3.7%), limb-length discrepancy of at least 1 cm was relatively common (7.5%, n = 37). Rerupture occurred in 115/1329 patients (8.7%), of which over 90% required revision. The authors conclude that growth disturbance can occur, but it is apparent that these rates vary between techniques. Attention to a reconstructive technique that minimizes rerupture is equally important. This paper does highlight that ACL reconstruction in the immature skeleton is not without complications, and that, realistically, these should not be underestimated.

Lumbar disc herniation in athletes: decompression under the local anaesthesia? X-ref

■ Percutaneous endoscopic discectomy (PED) is a widely applied technique for acute lumbar disc herniation (LDH). Certain sports have a relatively high rate of acute lumbar disc prolapse, particularly those with spine-based throwing activity such as cricket, and the condition is both debilitating and fairly common in these athletes. The cited advantage of PED is a quicker return to activity. Small incisions and less soft-tissue damage mean a hypothesized earlier and easier return to function. This, if true, would be an important advantage for the athlete. These authors from **Hiroshima (Japan)** report their

retrospective clinical cohort series consisting of 21 athletic patients presenting with LDH who had undergone PED.² In this relatively high performing group of individuals, the clinical team started physiotherapy with the aim to return to sports immediately. Outcomes were assessed using the visual analogue scale (VAS) for leg pain and low back pain, the Oswestry Disability Index along with reported complications, and time to return to sports and activity. This clinical series was predominantly young men (18/21), with a mean age of 23 years (15 to 43). Prior to surgery, patients had a mean VAS of 64 mm (SD 2.7) for leg pain and 62 mm (SD 2.2) for back pain. These were reported to have improved significantly in both cases, to 12 mm (SD 1.4) and 11 mm (SD 1.1), respectively. In this admittedly small series, the authors reported that there were no complications, and that 95% of patients were able to return to the preinjury level of play by nine weeks after PED. These results are certainly encouraging and, given the young nature of the cohort, it is heartening to see that more modern, less invasive approaches can be used to precipitate a return to play at an appropriate time.

Anterior and rotational knee laxity does not affect patient-reported knee function two years after anterior cruciate ligament reconstruction X-ref

■ The past few years have been difficult for the evidence-based arthroscopic surgeon, as larger randomized controlled trials have not been entirely supportive of many arthroscopic procedures. There are two ways of interpreting these trials. One reasonable explanation is that there truly is no difference in outcomes between