X-ref *For other Roundups in this issue that cross-reference with Sports see: Knee Roundup 5.*

Anterior cruciate ligament: early or late reconstruction? X-ref

■ While anterior cruciate ligament (ACL) reconstruction has had some bad press recently, with a number of randomized trials demonstrating little benefit over appropriate rehabilitation in the longer term, most experts would agree that an unstable knee is a valid reason for undertaking an ACL reconstruction. An ACL-deficient unstable knee is not necessarily a benign thing to treat expectantly, as there is plenty of data to show that symptomatic knee instability can result in secondary tears to the medial meniscus, or chondral damage to the condyle due to uncontrolled pivoting. There is little known about the effects of timings of ACL reconstruction on these outcomes specifically. While it stands to reason that the chance of secondary injury increases the longer a reconstruction is delayed, there is the argument that failing to appropriately rehabilitate the knee first will put the patient at risk of arthrofibrosis. We were delighted to see this new piece of evidence from the team in **Columbus, Ohio (USA)** that attempts to shed some light on this tricky conundrum: is it better to intervene early or later?[1] Overall, 609 patients, all of whom underwent primary ACL reconstruction at the originating institution, were studied. The chondral injury (or absence thereof) was classified at the time of arthroscopic reconstruction according to Outerbridge criteria, as was the medical meniscal tear. For the purposes of this study, they defined medial meniscal injury as that requiring surgical reconstruction. The authors undertook a comprehensive analysis to account for potential confounders in their findings in terms of patient demographics, sporting activity levels, and a history of prior knee injuries. The authors set out to establish what the relationship was between time to surgery and medial compartment health. Rather than treating surgical delay as a continuous variable, they undertook a discrete analysis for statistical convenience. However, they did establish the optimal time intervals to predict medial compartment health using Bayes information criterion values between fully adjusted regression models. Overall, after appropriate controls for confounders, it was established that a delay of surgery for around two months resulted in an over two-fold risk of medial meniscal injury (adjusted odds ratio 2.30; 95% confidence interval 1.04 to 5.12) requiring partial meniscectomy. It was also established that there was a lower rate of meniscal repair after eight weeks, which stands to reason. In terms of further damage to the knee, once you get to over five months following ACL injury, the authors established that there was a much higher risk of a high-grade chondral injury (Outerbridge > 3). This study specifically showed that the probability of preserving the menisci was low after eight weeks of injury and that the degree of cartilage damage worsened after five months. The results of this study indicated that it is desirable to operate early after injury to improve the postoperative outcome of ACL reconstruction.

Diagnosis of first-rib stress fractures: suspicion is the key X-ref

■ Stress fractures are difficult to diagnose, even in the more obvious of places, such as the tibia or fifth metatarsal. However, stress fractures can also occur in more unusual places, such as the first rib. Supposedly associated with overhead throwing athletes, this somewhat enigmatic diagnosis is one explanation for atraumatic shoulder pain when everything else has drawn a blank. As diagnosis is tricky, any series shedding light onto the clinical features is welcome. These authors from **Tatebayashi (Japan)** have reported the outcomes of 24 stress fractures of the first rib in 23 throwing athletes.[2] The authors report a case series describing the typical patient demographics, presentation, and associated symptoms. Patients had a mean age of 16.8 (13 to 25). The majority of cases were in the dominant arm, and diagnosis was made through an acute and new onset increase in pain when throwing or using a bat without a discrete injury. The majority of patients (n = 16) presented with posterior shoulder pain and took a little over six months to diagnose. At the time of diagnosis, 71% were healing and 29% had an established nonunion. The authors also went on to look at the best diagnostics and were able to demonstrate that, while only 46% of the rib is visible on a plain film of the shoulder, taking a cervical spine radiograph improves that to 97%. The authors take care to point out that the majority of the diagnosis is in the history. This study offers valuable insight into the typical patients and clinical findings of first-rib fatigue fractures and offers some interesting evidence into the typical configuration and diagnostic power of different imaging.

Suture augmented anterior cruciate ligament reconstruction X-ref

■ Many new technical ideas, treatment trends, and even diagnoses in orthopaedic surgery are driven by industry, sometimes without evidence of efficacy. Rerupture of anterior cruciate ligament (ACL) reconstruction is a complex multifactorial problem that includes contributions from patient risk factors, as well as surgical technique and postoperative rehabilitation. There is considerable controversy in the literature regarding graft choice and the contribution of this to rerupture rates. However, like many of these supposedly straightforward problems, there is no consensus for one graft choice over another. This clinical study from **Washington, D.C. (USA)** asks a somewhat different question, comparing the outcomes of standard ACL reconstruction with hamstring autograft or allograft *versus* that with the addition of a high-tension suture augment.[3] The addition of suture augmentation has shown great promise in other areas, and may also be applicable to ACL reconstruction. This study was a retrospective review reporting on patients with a minimum two-year follow-up. The two groups were matched by age, gender, body mass index, graft, and revision status. The report details the outcomes of 60 patients with a mean age of 29.5 years and reported follow up of 29.5 months. As would be expected in a matched series like this, there were no differences identified in the groups before surgery. Postoperatively, patients undergoing suture augmented ACL reconstruction reported significantly less pain and improved subjective outcome measures, in addition to faster and greater return to preinjury activity levels. However, while there was a trend to improved rate of return to preinjury activity levels, this was not significant. The authors concluded that the use of suture augmentation decreased pain and improved return to preinjury activity without evidence of overconstraint. While two years is considered the minimum for ACL reconstruction follow-up, most patients will return to 'full activity' between six and 12 months, but may not reach peak participation or performance levels for some time. Additionally, patients less than 18 years of age who are known to be at high risk of rerupture were excluded; this is the population that is most likely to show a difference and is of the greatest clinical interest in regard to avoiding rerupture. Suture augmentation of ACL reconstruction grafts makes intuitive sense and may be beneficial to the patient during the early course of their

recovery from ACL reconstruction, but its long-term benefit remains to be seen.

Failure of matrix-assisted autologous chondrocyte transplantation in osteoarthritic knees X-ref

■ The treatment of osteoarthritis in the young patient remains a considerable challenge for orthopaedic surgeons due to the high demand of these patients and the low functional capabilities of joint arthroplasties. Cartilage regeneration procedures hold considerable promise, but have, to date, not met these expectations. This paper from **Bologna (Italy)** analyzed the effectiveness of salvage for discrete chondral defects using matrix-assisted autologous chondrocyte transplantation (MACT) in the knees of 41 young patients.[4] All of these patients presented with cartilage lesions of 4 $cm^2 \pm 2$ cm^2 in size (Kellgren–Lawrence grades of 2 or 3) and had a mean age of just over 40 years old. The mean follow-up reported here was 15 years from the procedure. Results indicated an initial improvement in subjective knee scores (International Knee Documentation Committee (IKDC), EuroQol visual analogue scale (EQ-VAS), and Tegner scores) followed by progressive worsening of reported outcomes over time. IKDC and EQ-VAS improved up to two years and then significantly deteriorated by the final clinical evaluation, while Tegner scores improved at all follow-up points but did not reach preinjury levels. Patients undergoing MACT with another procedure did worse than those undergoing isolated MACT. Patients considered a failure of treatment or who converted to total knee arthroplasty made up almost 60% of the total cohort by 15 years of follow-up. The authors concluded that the use of MACT as a salvage procedure for young patients with cartilage defects led to a limited and minimal improvement, with the majority being considered failures or proceeded to knee arthroplasty at long-term follow-up. While there are limited options to treat young patients with knee osteoarthritis, total knee arthroplasty is not ideal due to the high demands these patients place on the prosthesis. This investigation presents a relatively small cohort with significant cartilage defects and underlying osteoarthritic changes, which is a particularly challenging scenario. Salvage cartilage restoration procedures may continue to hold some promise in those with an isolated lesion in the setting of intact cartilage, but it would seem that MACT is unable to meet the demands of this population when the lesion is present with considerable osteoarthritic degeneration, making these questionable indications for this procedure.

REFERENCES

1. **Everhart JS, Kirven JC, Abouljoud MM, et al.** Effect of delayed primary anterior cruciate ligament reconstruction on medial compartment cartilage and meniscal health. *Am J Sports Med* 2019;47:1816-1824.
2. **Funakoshi T, Furushima K, Kusano H, et al.** First-rib stress fracture in overhead throwing athletes. *J Bone Joint Surg [Am]* 2019;101-A:896-903.
3. **Bodendorfer BM, Michaelson EM, Shu HT, et al.** Suture augmented versus standard anterior cruciate ligament reconstruction: a matched comparative analysis. *Arthroscopy* 2019;35:2114-2122.
4. **Andriolo L, Reale D, Di Martino A, et al.** High rate of failure after matrix-assisted autologous chondrocyte transplantation in osteoarthritic knees at 15 years of follow-up. *Am J Sports Med* 2019;47:2116-2122.

Foot & Ankle

X-ref *For other Roundups in this issue that cross-reference with Foot & Ankle see: Wrist & Hand Roundup 6.*

Symptomatic venous thromboembolic events are low in total contact cast immobilization

■ Total contact cast (TCC) is widely applied for the management of diabetic foot complications, providing a low contact stress and thereby offloading the pressure areas. Although the lower limb is immobilized in a cast, there is a crucial difference in this group of patients compared with the usual patients immobilized in a lower limb cast: these patients are allowed to weightbear fully. There is now accumulating evidence and increasing concern that the incidence of venous thromboembolic events (VTEs) in patients immobilized in lower limb cast is not negligible, and that they require individualized risk-benefit assessment to determine the need for chemical thromboprophylaxis. However, the incidence of VTE in patients managed with TCC is unknown. In this retrospective cohort, researchers from **Wirral (UK)** investigated the overall incidence of VTE in patients treated with TCC.[1] Patients with a TCC were identified from the institution's plaster room records. A "casting episode" was defined as any length of time for which the patient was treated in a below-knee cast. If there was an interval of two weeks between the removal of one cast and the application of a further cast, this was considered as a new casting episode. Patients' electronic, case, and radiological records were reviewed. VTE episodes were identified by hospital records within a year of treatment with TCC. In what is a small series, 45/145 patients were excluded due to lack of notes. This left 100 patients (136 casting episodes) between 2006 and 2018 included in the study. Neuropathic ulcer was the most common indication for TCC application (n = 88) followed by Charcot ulcer (n = 40). The mean length of TCC treatment was 45 days. None of the patients were offered chemical prophylaxis. As expected, many patients had multiple medical comorbidities (59). Despite this, the VTE rate was low; only a single patient (0.7%) was known to have developed VTE nine days following removal of TCC. The authors proposed that this low incidence might be related to the fact that, although the limb was immobilized, patients were allowed to weightbear and therefore recruited their calf muscles to some extent, thus reducing the risk of venous stasis. Here at 360, we are not aware of any other evidence for the rate of VTE in patients managed with TCC and, therefore, despite the very low numbers of patients, this is worthy of note. Clearly, some large studies to investigate the risks of VTE in patients in lower limb casts are required and stratification by risk factors is clearly also going to be important.

Low incidence of adverse effects following intra-articular steroid injection of the ankle and the subtalar joint

■ Intra-articular steroid injection is a useful tool and a workhorse in the treatment of various foot and ankle conditions, but there is little data regarding its efficacy or side effects. Although complications are rare, they can happen, and there is not enough literature for an informed discussion with the patient. In this paper from **Boston, Massachusetts (USA)**, the authors set out to investigate the potential for adverse effects following intra-articular steroid injection of the ankle and