

X-ref For other Roundups in this issue that cross-reference with *Wrist & Hand* see: *Research Roundup 3*.

Extensor carpi ulnaris transposition in chronic instability

■ There are many causes of ulnar-sided wrist pain, many of which can be difficult to diagnose and treat. While extensor carpi ulnaris (ECU) tenosynovitis and tendinopathy are more frequent, instability of the tendon is an uncommon but debilitating problem, especially in young manual workers and athletes. The ECU courses over the ulnar side of the wrist within its fibrous subsheath, before diverting in the ulnarward direction towards the eventual insertion on the base of the fifth metacarpal. In supination, the resultant force vector acts on the ulnar wall of the fibrous subsheath. One cause for pathology and instability can be failure of the ulnar wall, which is associated with ensuing instability. Patients present complaining of pain and clunking. There is little published literature to guide treatment of ECU instability, so this short case series from **St. Louis, Missouri (USA)** is a helpful addition to the literature.¹ The 11 patients included in this report were subjected to various imaging studies; however, there is consensus in previous literature that the diagnosis is mainly clinical, with classic symptoms of snapping or popping sensation on forearm rotation. All were therefore diagnosed with the “scooping ice cream” movement, a provocative test to strain the ulna-sided restraints on the ECU, starting with the wrist in pronation, ulnar deviation, and extension and moving against resistance into supination. The series of 11 patients included 12 wrists over a five-year period reviewed retrospectively. The patients were mainly young, with a median age of 25 years. They were mainly athletes ($n = 7/11$) who had been injured during sporting activity. A dorsal transposition of the ECU tendon was performed, removing it from its subsheath and repositioning it over the fifth extensor compartment, where it was secured with a radially based flap of retinaculum. Although all patients were stated to have initially undergone conservative treatment, the median time from injury to surgical treatment was 3.5 months (1 to 24), which does seem rather short. Follow-up was at a mean of 39 months, and was assessed using the visual analogue scale (VAS) for pain, the Quick Disabilities of the Arm, Shoulder and Hand (Quick-DASH) questionnaire, and the Patient-Reported Outcomes Measurement Information System score

(PROMIS, a computer adaptive test using a bank of upper limb function and pain interference questions). Average patient satisfaction was 9.8 (out of 10), and pain VAS improved from 6.5 preoperatively to 0.2 postoperatively. The mean final Quick-DASH score was 1.8 and the mean final PROMIS upper limb score was 55.7, both of which were highly favourable, although there were no preoperative scores available for comparison. All patients returned to their original sporting activity at a mean of 2.6 months, and the non-sports patients returned to work at a mean of three months. There were two complications: one athlete had ongoing clicking requiring further surgery; and one other patient had pain symptoms that improved over time. Here at *360*, we would agree with the conclusion that for acute instability, even in athletes, there is good evidence for conservative management. For problematic chronic instability, however, this technique may be an appropriate option.

Cold hypersensitivity after hand injuries: a prospective seven-year follow-up

■ Cold intolerance, sometimes referred to as hypersensitivity, is a difficult problem that can follow severe hand injuries, and is infrequently followed up to its conclusion in busy surgical clinics. It has a poorly understood pathophysiology, has little in the way of reliable treatment options, and can cause debilitating pain. While cold intolerance may not be a problem that can be addressed surgically, it does affect a large number of patients with hand injuries, as well as those with degenerative conditions or post-surgical changes. It has previously been reported that patient-reported sensitivity to cold diminished between one and two years, and again between two and three years post-injury. Researchers from **Oslo (Norway)** have recently revisited this topic in the same patient cohort to reassess cold hypersensitivity status between three and seven years post-injury.² The McCabe Cold Sensitivity Severity (CSS) scale was used, which is a four-item questionnaire addressing discomfort in the hand during everyday indoor activities involving different intensities of cold exposure, such as holding a glass of ice water, getting out of a hot shower, or holding a frozen package from the freezer. Each item is scored using a visual analogue scale between 0 and 100, and then summated. Patients also self-reported their cold hypersensitivity problems as none, mild, moderate, severe, or extreme. Finally, and importantly, the authors

assessed the impact of cold hypersensitivity by asking how much the problem limited the patient in day-to-day activities. In 71 patients reviewed, 90% reported ongoing problems with cold hypersensitivity at the seven-year follow-up, 20% of which were graded as severe. There was minimal change in the CSS scale results between three and seven years, indicating no significant improvement. When assessed using the self-reported tool, 28% of patients reported subjective improvement, 58% remained static, and 14% described a worsening of the problem. There were no significant changes in the functional limitations during this time. Reassuringly, 30% felt their cold hypersensitivity had improved between five and seven years, and felt that they had a higher tolerance of the cold. These patients had a variety of injuries; however, they were generally at the severe end of the spectrum, with 58% having severe crush injuries and 50% undergoing replantation, revascularization, or repair of major nerves at the wrist. The authors do not provide a breakdown of cold hypersensitivity symptoms by either mechanism or surgery performed, so it is difficult to draw conclusions regarding the severity of injury or surgical insult. This paper contributes to our knowledge surrounding the long-term natural history of cold hypersensitivity following severe hand injuries, and aids our ability to counsel patients about the long-term prognosis. Even in the longer term, there seems to be some scope for improvement in subjective symptoms for those affected, although relatively few patients in this study recovered completely.

Nutrition or attrition? X-ref

■ The problem of extensor pollicis longus (EPL) tendon rupture in distal radius fractures is not new, with injuries variously attributed to mechanical attrition from callus, interruption to the segmental vascular supply of the tendon, or iatrogenic injury from volar locking plate screw penetration. There has been a particular interest in EPL rupture, given the possibility of it being associated with dorsal screw penetration. Narrowing of the EPL groove caused by callus formation and displacement of Lister's tubercle has been hypothesized to precipitate delayed ruptures following fracture. In order to elucidate the effect of the pattern of Lister's tubercle injury on EPL rupture, researchers from **Daejeon (South Korea)** have reviewed 314 adults undergoing volar locking plate fixation of closed, isolated distal radial fractures.³ The patients had no history

of previous tendon insult or trauma to the wrist. Exclusion criteria included patients who required a dorsal approach, patients with an associated carpal or triangular fibrocartilage complex injury requiring surgery, and patients with a history of: painful degenerate wrist, finger, or elbow conditions; rheumatoid arthritis; diabetes mellitus; or tendinopathy around the flexor or extensor tendons. All patients underwent cross-sectional imaging using CT and 3D reconstructions, and a novel classification of involvement of the third dorsal wrist compartment was used to assess the architecture of the fracture. A type I fracture exhibited no fracture line or fragment in Lister's tubercle or the EPL groove, a type IIA fracture exhibited a fracture in Lister's tubercle or the EPL groove with less than 2 mm of displacement, a type IIB fracture was similar but with more than 2 mm of displacement, and a type III fracture demonstrated the so-called 'island-shaped' fragment displaced from the floor of the EPL groove. Patients were followed for at least two years and were divided into two groups: EPL intact or EPL ruptured. EPL ruptures were noted in 18 patients (5.7%), and there was no demonstrable difference in the demographics between the ruptured and intact patients. The rupture group had a greater proportion of more significantly displaced intra-articular fractures ($n = 4/8$) compared with the intact group. The fracture pattern around Lister's tubercle appeared to correlate with the risk of developing an EPL rupture. There were three ruptures in 279 patients with a type I fracture, five ruptures in 16 patients with a type IIA fracture, five ruptures in nine patients with a type IIB fracture, and five ruptures in ten patients with a type III fracture. The status of the EPL groove at exploration was commonly noted to demonstrate bony spicules or callus in the base, or callus encircling the groove entirely in ruptured, rather than pristine, grooves or clefts within the dorsal cortex. The overall incidence of EPL rupture in this operatively treated cohort was 5.7%, higher than many previous reports. In this cohort, all screws were purposefully kept short of the dorsal cortex, likely accounting for the absence of any prominent screws. This study certainly suggests that attrition may have an important part to play in the development of EPL rupture, and that consideration of the fragments around Lister's tubercle may have a role in preventing rupture. As of yet, however, it is not clear what this intervention would be.

Does bowstringing matter in trigger fingers?

■ Surgery to the flexor pulley system of the hand inevitably causes a degree of concern among surgeons regarding the risk of postoperative

bowstringing of the flexor tendons. Cadaveric studies have demonstrated bowstringing following release of the A1 pulley and, as a result, many surgeons consent their patients for a loss of grip strength in the operated digit postoperatively. The impact and degree of bowstringing following A1 pulley release with open and percutaneous techniques have not been well investigated *in vivo*. A team from **Cheonan (Korea)** randomized patients to either open or percutaneous trigger digit release.⁴ Patients were followed up with ultrasonography of the digit, a visual analogue scale (VAS) for pain, the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire, and pinch power scoring. The study was designed to test the hypothesis that percutaneous release may have an advantage over open release in terms of bowstringing. The authors undertook clinical assessment preoperatively and again at four, 12, and 24 weeks postoperatively, with bowstringing (determined as the distance between the dorsal surface of flexor digitorum profundus (FDP) tendon and the volar surface of the metacarpal head) assessed at 12 and 24 weeks. The patients included were all aged 20 years or over, and had failed non-surgical treatment of a demonstrably triggering digit or digits. Patients with diabetes mellitus, inflammatory or crystal arthropathy, connective tissue disease, previous surgery or trauma to the digit, or cognitive impairment were excluded from the study. Patients with coexisting trigger thumb were also excluded, so as not to bias the measurements of pinch strength. There were 57 patients, with 34 trigger digits released using the percutaneous technique and 31 trigger digits released using the open technique. The percutaneous and open surgical groups were comparable in terms of age, gender, degree of triggering, digit(s) involved, and preoperative bowstringing. At 12 weeks postoperatively, bowstringing during resisted flexion had significantly increased in both groups (mean of 0.67 mm in the percutaneous group; 1.39 mm in the open release group) and the open release was also significantly larger than the percutaneous group. There were no differences in the VAS pain or DASH questionnaire at any timepoint. Interestingly, three patients in the percutaneous group required revision surgery to resolve persistent triggering. Furthermore, while bowstringing occurs following A1 pulley release and is more common in the dominant hand of men, there were no observed correlations between the degree of bowstringing and any of the measured clinical or patient-reported measures at either 12 or 24 weeks in this study. The degree of bowstringing caused by an A1 pulley release does not seem to be clinically important in most patients regardless of the technique used.



Pyrocarbon proximal interphalangeal arthroplasty

■ A perfect solution for the arthritic proximal interphalangeal (PIP) joint remains unsolved; arthrodesis is reliable but sacrifices movement, which can be functionally limiting, particularly on the ulnar side. Many techniques for arthroplasty exist, but there is no clear frontrunner in terms of clinical effectiveness and cost. In this study, authors from the Mayo Clinic in **Rochester, Minnesota (USA)** present their honest mid-term follow-up of pyrocarbon implants.⁵ The authors report the results of 184 primary PIP pyrocarbon joint arthroplasties implanted in 109 patients over 15 years. The surgery was performed by six surgeons, all using the same implant. A total of 170 implants had complete follow-up to two years via an institutional joint registry. Of those, 49 patients had a diagnosis of inflammatory arthritis. In all cases, the approach was universally dorsal, with either a Chamay turn-down or tendon splitting approach, depending on anatomy. At a median follow-up of 5.2 years (2 to 14), 34% of joints had undergone further surgery. Of these, the majority were to revise the implant ($n = 36/58$), with the remainder attempting to improve function but leaving the implant *in situ* ($n = 22/58$). In terms of complications, there were 16 dislocations, 14 joints that were painful and stiff, three joints demonstrating recurrent subluxation, two loose joints, and one infected joint. Of the joints not requiring revision surgery (134 at last follow-up), 95% reported no or mild pain postoperatively, compared with only 13% preoperatively. Grip strength and range of movement did not improve postoperatively. The mean preoperative range was 40° compared with 41° postoperatively. A worse preoperative range predicted a poorer postoperative range of movement. In general, grip strength and range of movement were lower in the patients with inflammatory arthropathy, although this could be an indication

of poorer preoperative condition. Only two joints were revised for loosening, but 51% demonstrated subsidence radiologically. This appeared to be progressive in 36% (47 joints) at a follow-up of 5.4 years. Although pyrocarbon is a favourable material for its more biological modulus of elasticity and bearing properties, there is little capacity for bony ingrowth, and the radiological ‘halos’ seen in this paper probably represent toggle associated with a loose implant. While the authors state that 79% of implants were retained, a revision surgery rate (for any reason) of 34% is problematic. With time and progressive radiological subsidence, it seems likely that the revision rate will increase. Compared with large joint arthroplasty, this is a poor performance. Furthermore, this is a simple registry study, and patient outcome and satisfaction have not been considered. Maintaining movement in an arthritic PIP joint remains an unsolved problem, but it would seem that the use of pyrocarbon implants is not currently an effective or reliable answer.

MRI changes in the triangular fibrocartilage complex: relevant or not?

■ Ulnar-sided wrist pain is a challenge to diagnose and investigation often utilizes an MRI scan. It is well recognized that triangular fibrocartilage complex (TFCC) ‘pathology’ is seen in symptomatic and asymptomatic individuals, and that the prevalence of pathology increases with age, in common with other conditions with a degenerative aetiology. In many patients, pathology of the TFCC is asymptomatic, but the background incidence of asymptomatic TFCC degenerative change in the population is not known and so it is difficult to estimate the probability of a ‘false-positive’ finding. It does seem probable that the TFCC may be wrongly attributed as the cause of wrist pain in some individuals. A multinational group of researchers led from **Boston, Massachusetts (USA)** have investigated the prevalence of TFCC signal changes in patients undergoing MRI of the wrist and compared this with the clinical suspicion of pathology reported.⁶ The MRI reports of 1134 patients who had undergone wrist MRI for any reason across five academic centres over a three-year period were reviewed and form the basis of this study. In cases where multiple scans had been performed during the period, only the first scan was considered for the purposes of the study. Any identified signal change in the TFCC was considered a positive finding and, in these cases, the clinical notes were thoroughly reviewed, looking in detail at the MRI request, clinical documentation, and examination findings. Where there was clinical suspicion of TFCC pathology – for example,

“ulnar-sided wrist pain” – this was recorded. If the MRI was performed for another reason, “low clinical suspicion of TFCC pathology”, this was also recorded. Overall, 43% of MRI scans demonstrated an abnormality in the TFCC. This increased from 31% in the 18-to-30-years age group, to 69% in the over-70-years age group. Multivariate analysis confirmed a significant increase in likelihood of TFCC pathology with age, as would be expected. Where there was clinical suspicion of TFCC pathology, 60% of patients had pathology confirmed on MRI. Conversely, in those with low clinical suspicion, an abnormality was still demonstrated in 37% of cases. Of most interest are the cases where the MRI was not obtained for ulnar-sided wrist pain (861 scans). Here, the prevalence of TFCC pathology was 37% overall, increasing from 24% in the 18-to-30-years age group to 70% in the over-70-years age group. This study confirms that TFCC abnormalities occur both in patients with ulnar-sided wrist pain and in those who are asymptomatic, with the background prevalence increasing with advancing age. This should remind us that clinical diagnosis should always come first, and that scan findings are not necessarily pathological, particularly where the TFCC is concerned.

Thumb carpometacarpal joint injections best avoided prior to surgery

■ Intra-articular injections are commonly performed for basal thumb osteoarthritis throughout the hand at the first carpometacarpal joint (CMCJ), with the literature showing variable success for this treatment both in terms of magnitude and longevity of any symptomatic improvement. Injections, particularly corticosteroid, have been identified to have deleterious effects in other joints when performed prior to formal surgical intervention, with fairly convincing evidence in the knee that steroid injections prior to surgery increase the infection rate. Using a ‘big data’ study, this team from **Maryland, California, and Michigan (USA)** sought to investigate whether there was an associated excess complication rate when injecting the CMCJ after surgery.⁷ They searched an insurance database for patients with CMCJ arthritis treated with interposition arthroplasty over a six-year period to 2015, who had at least two months of subsequent follow-up, to capture early complications, including wound problems and infections. Over 16 000 patients were included in the analysis and an overall 21% complication rate was identified. Treatment with corticosteroids or hyaluronic acid injections preoperatively was recorded, as were general demographic and medic-

analyses were performed. The majority of the patients underwent trapeziectomy with interposition arthroplasty, and 28% had undergone an injection prior to operation, the vast majority with a corticosteroid. Univariate analyses showed a significant risk of complications in those whom an injection had been performed. Diabetes, smoking, and increased number of comorbidities were also significant predictors. Interestingly, the overall number of steroid injections given was an independent predictor, but the lag time to surgery from injection was not. The multivariate model showed that steroid injections resulted in a 20% increased odds of complication, with more than three injections increasing the odds of a complication by 70% (odds ratio 1.7; 95% confidence interval 1.3 to 2.1). Big data studies obviously have difficulties, including miscoding and an inability to stratify the severity of the disease or draw on any data not included in the initial data set. Because not all patients with arthritis require surgery, and it is unclear whether the increased risk of an injection has a finite lifespan, it is difficult to draw firm conclusions or recommendations from this study. It may be prudent to avoid multiple injections, especially in those in whom surgical intervention seems likely to be required, given the cumulative effects of multiple injections. It is also of interest, in an age when clinicians are often encouraged by fundholders to perform less invasive treatments before surgical intervention, that this strategy may be deleterious in the long run. Further study is surely required.

Radial inclination and stability of the distal radial fracture

■ In pragmatic randomized controlled trials of outcomes following distal radius fractures, radiograph appearances, classifications, and other measurements have been seen to correlate relatively poorly with clinical outcomes. There were a host of factors identified in the early 2000s, mostly from studies originating in the trauma unit in Edinburgh, showing that there are some subgroups in whom instability or a poor clinical outcome are likely. We know from this work that there are subgroups of patients who are disproportionately affected by a single parameter, which these broad-brush studies are not really designed to detect. Relatively little is known about the distal radioulnar joint (DRUJ) and its relationship to stability following fractures. This study from the group in **Tokyo (Japan)** set out to establish what, if any, relationship the loss of radial inclination has on stability.⁸ Their cadaveric study also aimed to examine the effect of a triangular fibrocartilage complex (TFCC) tear on stability in this context. Six cadaveric arms underwent

osteotomy of the distal radius and application of a custom-made jig to alter radial inclination. The stiffness of the DRUJ of each specimen was measured prior to osteotomy with the forearm in neutral then 60° of pronation and supination. Initially, the specimens were subjected to a decreased radial inclination of 10° then 20°, and, finally, an increase of 10° from the initial value, with DRUJ stiffness measurements taken. The TFCC was then sectioned on the volar (three specimens) and the dorsal (three specimens) sides, and the DRUJ stiffness was measured, followed by complete sectioning of the TFCC and further testing. When the TFCC was intact, DRUJ stiffness increased significantly when the radial inclination decreased by both 10° and 20°. Partial sectioning of the TFCC decreased stiffness by 3% to 10%, and by 24% to 29% when completely sectioned. Furthermore, where the radial inclination is reduced, the DRUJ may be stable even in the

context of partial or complete TFCC tear, possibly ameliorating this problem. Based on the results of this biomechanical study, the authors suggest correction of radial angulation deformities of the distal radius to within 10° of the normal wrist when the TFCC is intact to reduce the sequelae of a stiff DRUJ. While this may be an attractive idea, the clinical impact is extremely uncertain.

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