

their practice, and these standards provide a useful approach for treating these patients.

Dorsally displaced distal radial fractures in the elderly: a randomized controlled trial **X-ref**

■ The use of locking plate fixation for distal radius fractures is commonly used but often poorly justified, given recent developments in the literature base. An often-cited original justification for using locking plate technology was in osteoporotic distal radius fractures of the elderly, with this forming the described indications for many products available. However, these patients are excluded from some trials and, as such, it was refreshing to see a trial targeting this group. This study led from **Stockholm (Sweden)** is a well-designed randomized controlled trial comparing nonoperative treatments with a volar locking plate for dorsally displaced distal radius fractures in the elderly.⁷ A total of 140 patients were randomly allocated, with 72 in the plaster group and 68 in the volar locking plate group. The Patient-Rated Wrist Evaluation (PRWE) score, Euro-Qol five-dimension (EQ-5D) score, Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire score, grip strength, range of movement, complications, and radiological outcomes were recorded at three and 12 months after the intervention. At three months, patients treated with a volar locking plate had a significantly better median PRWE score (10.3 vs 35.5 points), a significantly better DASH score (14.4 vs 29.2 points), and a significantly better grip strength (71.0% vs 53.9% of the uninjured hand). These outcomes in the volar locking plate group remained significantly better at 12 months. Complication rates were similar, with 11% major complications in the nonoperative group compared with 14% major complications in the volar locking plate group, and 11% minor complications in the nonoperative group compared with 20% minor complications in the volar locking plate group. The investigators concluded that their results suggest a significant benefit for the elderly patient with an unstable dorsally displaced distal radial fracture

being treated with a volar locking plate, citing the significantly better grip strength, PRWE and DASH scores in the operated group at both three and 12 months. Quality-of-life scores were similar, however, and an in-depth economic analysis would be beneficial. It is also not clear how many of the group could feasibly have been treated with Kirschner wires, which would have been a cheaper and possibly equally effective way of treating some of the fractures. While contributing to the evidence base and no doubt affirming the prejudices of some, this paper is not the complete answer to this problem.

The Distal Radius Acute Fracture Fixation Trial (DRAFFT) at five years

■ With the most appropriate and effective treatment for a wide variety of distal radius fractures not yet evident, this significant paper from **Warwick (UK)** reports the five-year follow-up of the Distal Radius Acute Fracture Fixation Trial (DRAFFT) randomized controlled trial.⁸ This compared Kirschner wire fixation with volar locking plates for dorsally displaced fractures of the distal radius. This was a multicentre, two-arm, parallel-group randomized controlled trial including patients with a distal radius fracture within 3 cm of the radiocarpal joint requiring surgical fixation. Cases were excluded if the articular surface was sufficiently displaced to require open reduction. The mean age of patients was 58 years (19 to 89). The Patient-Rated Wrist Evaluation (PRWE) was the primary outcome measure; the EuroQol five-dimension three-level (EQ-5D-3L) score and further surgery related to the index fracture were the secondary measures. At 12 months, 90% of recruited patients provided scores, which declined to 66% at year two and 44% at year five. At all timepoints during the five-year follow-up, there was no clinically significant difference in the PRWE. At five years, the PRWE was 8.3 in the wire group and 11.3 in the plate group. Similarly, there was no difference in the health-related quality-of-life scores. In the five years following the index procedure, three of the 198 patients followed up had further surgery: one in the wire group and two in the ORIF

group. The authors therefore conclude that there was no difference in wrist pain, function, or quality of life between the groups in this cohort. This seems to obviate concerns about early development of osteoarthritis, albeit at a relatively short follow-up for this condition. There was attrition in the follow-up rate, in part because the trial sponsor required the patients to re-consent for participation in the five-year study. The authors postulate that patients who were asymptomatic would have therefore seen a higher dropout rate, which seems reasonable. Another interesting conclusion is that a patient's wrist function is likely to continue to improve in the five years following their injury.

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Shoulder & Elbow

X-ref For other Roundups in this issue that cross-reference with *Shoulder & Elbow* see: *Sports Roundup 2; Wrist & Hand Roundup 6; Trauma Roundup 7; Children's orthopaedics Roundup 3.*

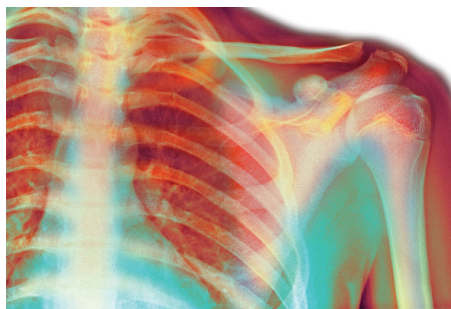
Posterior interosseous nerve and biceps repair **X-ref**

■ The repair of a ruptured distal bicep tendon can be performed using a variety of approaches,

techniques, and implants. Having multiple ways of performing this repair suggests that no method is perfectly optimal, and each have a trade-off in terms of risks and benefits for the patient. A

frequently employed technique is the cortical biceps button, which, among other risks, is well recognized to endanger the posterior interosseous nerve as it passes posteriorly around the proximal radius through the supinator muscle. There have previously been multiple anatomical studies performed that have dissected the posterior interosseous nerve and measured its distance to the site on the posterior aspect of the radius where the button emerges. This group from **New York, New York (USA)** have taken a novel approach to seek a more comprehensive understanding of the relationship of the prosthesis to the posterior interosseous nerve.¹ This study revolved around using a radiopaque dye injected into the radial nerve proximally in order to trace its route as it travels distally. The authors used two groups of five cadaveric arms, and a guidewire was inserted as part of the technique, followed by a cortical button. The distances were then measured to the posterior interosseous nerve. In the first group, a two-incision approach was used and a CT scan was then performed in pronation to best mimic surgical positioning. In the second group, a single incision approach was used and a CT scan was then taken in supination. By injecting the dye and measuring radiologically, the need for dissection to locate and measure the nerve location was obviated, in contrast to other studies. A sample-size calculation was performed, which suggested that five anatomical specimens would be required in each group to detect differences, but the nature of this calculation is unclear. The effect of the size of the individual specimens also seems to be very much unaccounted for. However, the results presented are a useful addition to what is already out there in the literature. The single-incision technique, with the arm in full supination, had a mean distance between the posterior interosseous nerve and the far cortical perforation of the radius of 9.4 mm (SD 2.8); the minimum distance seen in any of the five specimens was 5.7 mm. Using a two-incision approach, the mean distance between the posterior interosseous nerve and the far cortical perforation of the radius was 8.8 mm (SD 3.0); the minimum distance in these five specimens was 4.2 mm. The cortical button used was 10 mm in length; after deployment, a minimum of 5 mm from the far cortical perforation site is therefore required to allow safe deployment of the button. This would suggest that the two-incision approach had a greater risk to the posterior interosseous nerve than the one-incision approach. Regardless of approach, there is a reported incidence of damage to the posterior interosseous nerve and the consequences of this can be catastrophic. Any technique that involves perforating

the far cortex of the proximal radius is associated with risk to the posterior interosseous nerve and each surgeon should counsel their patient of these risks. A greater awareness of the anatomy can only improve matters.



Outcomes of posterior shoulder instability management

■ Long-term outcomes of posterior shoulder instability remain unclear, largely due to the relatively rare occurrence of this pathology and variability in treatment. Due to its rarity, it is often managed conservatively, possibly due to lack of familiarity with operative management or confidence in its outcomes. If we knew that a high proportion of these patients may proceed to surgery, then we may counsel them differently. This multicentre group of investigators led from the **Rochester, Minnesota (USA)** examined the rate of delayed surgery between one and ten years from presentation with posterior shoulder instability and evaluated predictive factors for delayed repair.² This study aim was accomplished by retrospectively examining the medical records of all patients with posterior shoulder instability in a region of Minnesota, who were identified by using an epidemiological database that covered the years 1994 to 2015. For inclusion in this series, patients had to have operative or radiological evidence of posterior instability, a minimum of one year's nonoperative management, and a minimum of five years' follow-up. A total of 149 patients with posterior shoulder instability were identified, 64 underwent operative treatment at the time of diagnosis and the remaining 79 were treated nonoperatively for at least one year. For the nonoperative group, 37% had undergone surgery by five years and 49% at ten years. There appeared to be a trend towards delayed surgery being required in obese patients and in nonthrowing athletes, including contact athletes and weightlifters, but these were not statistically significant. Those undergoing surgery had a significantly increased risk of progression of osteoarthritis. Including the initially operated group, 70% of the patients in this series went on to have surgical

management. This suggests that nonoperative treatment of posterior shoulder instability may not be tolerated by all patients, and that the majority will require surgery at some point. However, we must remember this is a retrospective observational study with multiple sources of potential bias, and the particulars of nonoperative regimes are not known. Only including patients with imaging studies may give an overestimation of the proportion treated operatively, so an alternative conclusion may be that the data simply reflects recent trends in operative management of this pathology.

Systematic review and meta-analysis of early outcomes and complications of arthroscopic Latarjet

■ The Latarjet procedure is an important and versatile tool in the management of shoulder instability. In addition to the traditional open technique, there has been an increased interest in the development and application of an arthroscopically performed procedure. The purported aim of this procedure is to permit a faster recovery and a decreased risk of complications, but this is well recognized to be at the expense of increased technical demand and a steep learning curve. It is not yet clear from the literature if this is a triumph of technique over sense, or if it genuinely offers the patients a better outcome without altering the complication profile. In order to compare these two techniques, researchers from **Rome (Italy)** have undertaken a systematic review and meta-analysis evaluating the outcomes and complications of both open and arthroscopic Latarjet procedures.³ This review included 14 papers detailing the outcomes of 813 patients with a mean follow-up of 24.5 months. Subjective outcomes were comparable between the groups when comparing outcome measures with Walch–Duplay and Rowe scores, which were 89.6 and 90.2, respectively. The overall complication rate was 16.5%. When only comparative studies were considered, however, there was a 24% rate in the arthroscopic group and 15% in the open group. The overall risk of recurrence of instability was 6.5% in the arthroscopic group and 4% in the open group, while the risk of revision surgery was 5.7% in the arthroscopic group and 2.9% in the open group. The authors concluded that arthroscopic Latarjet is a reliable procedure, similar to the open procedure, but may be associated with less pain in the early postoperative period and faster recovery. It needs to be remembered, however, that performing an arthroscopic Latarjet is technically more difficult, with a higher complication rate and requiring more expensive implants. Furthermore, the effect of the learning curve is

not insignificant, and the authors also point out that early series are more likely to be performed by superspecialist surgeons, potentially limiting the applicability to surgeons who are not subspecialists. Despite the limitations inherent in a systematic review and meta-analysis of this subject, as well as the steep learning curve known to be associated with the arthroscopic technique, it may not afford the improved outcomes and decreased side-effect profile until the surgeon has reached a certain, as yet undefined, level of proficiency.

Learning curves in the arthroscopic Latarjet procedure

■ Following hot on the heels of the previous paper is this study from **Pfäffikon (Switzerland)**.⁴ There are many different criticisms levelled at those who advocate widespread practice of the arthroscopic Latarjet procedure, with one being the steep learning curve required to master the technique, a problem that this study specifically seeks to explore. The learning curve will be of particular concern to surgeons who perform a limited number of procedures. Various studies have suggested that the operative time is longer for the first 15 or 20 cases, and others that argued that ten cases were required before a conversion to open procedure was no longer likely to be required. In order to investigate this, a group of five shoulder surgeons pooled and analyzed their first 25 cases of arthroscopic Latarjet, seeking to elucidate improvements in surgical time, graft placement, complications, and recurrence of instability. The cohort consisted of 125 patients, all part of an individual surgeon's learning curve. These patients were predominantly male (87%), with the majority being primary procedures (82%). The overall surgical time decreased within a less than two-year timeframe from an average of 124 minutes in the first five cases to 93 minutes in the last five cases performed by each surgeon. The recurrent instability rate was 5%, of which the majority was traumatic in origin. There were 22 events requiring further treatment and 10% of patients required revision surgery that was not trauma-related; 75% had a bone block position, which was considered to be ideally placed. Overall, the authors conclude that surgical time can be reduced after 20 cases, but they observed that the complication rate did not change throughout this series. The authors also concluded that the arthroscopic procedure is a viable method, with comparable results and the advantages of arthroscopy. Here at 360, it seems to us that, given the comparable results and marginal benefits, this is not a procedure for the occasional shoulder surgeon. While the surgeons included in this study are

likely to be the ideal candidates for transitioning to an arthroscopic approach, they are obviously not representative of the general surgical population. Even those with a specialist shoulder practice may struggle to reach the numbers required to justify the potential difficulties for the surgeon and the possible pain for the patient. Equally, there is a variety of practical surgical skill levels within the community and, while clearly the surgeons studied here are true experts, the technical difficulty may prove too much in the hands of many.

Routine fixation of displaced midshaft clavicle fractures is not cost-effective

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■ The choice of operative fixation or conservative management of displaced midshaft clavicle fractures is a contentious issue, with plenty of evidence to support any reasonable stance. This leads to the view that an individualized treatment approach should be taken, with the risks and benefits of the respective options discussed with the patients. This approach is upheld by the Cochrane Collaboration, but what is the cost to society? Previous cost analysis studies have been performed in insurance-based healthcare systems and use assumptions of health benefits beyond one year that are not evidence-based. This paper from **Edinburgh (UK)** reports a cost-effectiveness analysis embedded in their previously reported randomized controlled trial.⁵ In this cost-effectiveness analysis, 178 patients were available, of whom 92 were treated conservatively *versus* 86 who received early plate fixation of displaced midshaft clavicle fractures. The incremental cost-effectiveness ratio (ICER) expressed the cost per quality-adjusted life-year (QALY). The authors utilized a general health status index in the form of the Short-Form Six-Dimension (SF-6D) to calculate this cost at 12 months. The mean 12-month SF-6D was 0.9522 in the conservative group and 0.9607 in the operative group, giving a very small cost-effectiveness advantage favouring fixation that did not reach significance. The cost of fixation was £5400 and the cost of conservative management was £1320. This meant that the ICER was approximately £480000 per QALY and that the benefit of operative treatment would need to be apparent at 24 years to justify the expense. Nonunion was the only factor to adversely affect the SF-6D at 12 months. This study demonstrates that the routine fixation of displaced midshaft clavicle fractures is certainly not cost-effective. The cost is comparable to treat a nonunion surgically with increased morbidity at this stage, which suggests that targeted fixation of fractures with a propensity to nonunion would be a more cost-effective

strategy. Further studies are clearly required to clarify firm indications for this approach.

Cost-effectiveness and satisfaction following arthroscopic rotator cuff repair: does age matter?

■ There has been a huge increase over the last decade in the number of rotator cuff repairs undertaken, and this procedure is well recognized to be effective in many patients. With increasing muscle atrophy and tendon degeneration, tears in older patients are more common and often larger. Furthermore, comorbidities and tendon quality are thought to impede the capacity for tendon bone healing. The condition is a significant economic burden but has a previously reported cost per quality-adjusted life-year (QALY) of around £2400. In order to investigate the relationship between age and health economic outcomes in older patients where they may not reap a significant benefit from the procedure, this group from **Edinburgh (UK)** performed a cohort study of 112 patients followed after arthroscopic rotator cuff repair.⁶ These patients were followed for two years using the Disabilities of the Arm, Shoulder and Hand (DASH) score, the Oxford Shoulder Score (OSS), and the EuroQol five-dimensional (EQ-5D) questionnaire. The cost of the procedure and associated treatment was recorded along with complications. Propensity score matching allowed comparison between those below and above 65 years of age. There were outcomes available for 92 patients (82% of the cohort). The patients completed a two-year follow-up and had an overall mean age of 60 years. The authors were able to report significant improvements in the mean DASH score from 48 to 15 at one year and also in the OSS scores from 26 to 40. There was no significant change in scores between one and two years postoperatively. The mean EQ-5D score improved from 0.54 to 0.81 at one year. No difference was detected between those aged below or above 65 years in respect of EQ 5D gains or shoulder function scores. In terms of promoter scores, 87 of the patients were promoters and five were passive, giving a mean net promoter score of 95. The incremental cost-effectiveness ratio was £13550 per QALY, decreasing at two years to £5700 per QALY. This was also not different between the age groups, but, interestingly, smokers had an incremental cost-effectiveness ratio four times more expensive. Although the cohort is relatively young, and extreme old age was not stratified, this study does appear to validate a policy of offering surgery to selected patients in the over-65-years age group in the expectation of good outcomes at a reasonable cost. Age should clearly not be a bar to rotator cuff surgery, rather amenability to surgery.

Posterior glenohumeral dislocations and occurrence of associated injuries

■ The shoulder joint is the most frequently dislocated synovial joint within the human body. However, despite the common diagnosis, just 5% of injuries occur in a posterior direction, meaning that relatively little research is directed towards this distinct pathology. This is also reflected in the general awareness of the condition, which seems relatively low, with anywhere from 50% to 80% of posterior dislocations being missed at initial presentation. In order to clarify and consolidate the evidence with respect to the aetiology, diagnosis, and treatment of this pathology, this group from **Dublin (Republic of Ireland)** performed a systematic review of studies conducted between 1997 and 2017.⁷ All of the studies reviewed aimed to report on both acute subluxation or dislocation of the glenohumeral joint posteriorly, in addition to the aetiology of the lesion. Overall, 54 studies were identified, including a total of 182 patients with a mean age of 44 years. Seizures were implicated in almost 40% of patients with 9% attributable to sports pursuits, 12% reported following road traffic accident, and 4% following electric shock. Only one patient had multidirectional instability listed as a causative factor. Delay in diagnosis was not uncommon, ranging from a few days up to 25 years after the index event. Open reduction was the most common treatment method utilized in 142 patients and a variety of fixation methods were also described, including the McLaughlin, modified McLaughlin, and Neer procedures, as well as a multitude of other methods, including arthroplasty, open reduction internal fixation, and resection arthroplasty. Reverse Hill–Sachs lesions occurred in 78 shoulders and proximal humerus fractures in 12 shoulders, with diaphyseal fractures associated with dislocation in a further seven patients. Only four patients had evidence of nerve injury, with three axillary nerve palsies and one suprascapular nerve palsy. In this review cohort, only two patients were identified and reported as having subsequently developed osteonecrosis of the humeral head. This review article nicely summarizes the recent

literature on the aetiology of posterior shoulder dislocations, although the existing research is relatively limited in volume and quality. Seizures are the largest independent cause and, in this context, bilateral injury has been proven to be not uncommon, as is to be expected.

Infection in reverse shoulder arthroplasty

■ The range of indications for reverse shoulder arthroplasty have expanded significantly since the initial introduction of the prosthesis, and the number being performed is expanding rapidly in most healthcare systems. While the clinical results are widely reported to be impressive, especially in patients with poor rotator cuff function, the procedure is not without its complication profile. The technical nature of the surgery and the need for large open approaches is probably the reason for the higher complication rates. It has been identified previously that the risk of deep infection is higher in reverse polarity prostheses when compared with their anatomical counterparts. Various theories have been advanced for this, including the relatively larger anatomical dead space that is produced with a reverse polarity joint arthroplasty. In order to understand this effect and its size in more detail, a group from **Copenhagen (Denmark)** interrogated the Nordic Arthroplasty Register Association dataset.⁸ Overall, 17730 primary shoulder arthroplasties were recorded between 2004 and 2013 and, using the Kaplan–Meier method, the ten-year cumulative revision rate due to infection was reported for the whole cohort and by arthroplasty design. A Cox regression model was then utilized to obtain the hazard ratio of the relative risk of revision due to infection. Over the study period, at a mean follow-up of three years and nine months, 188 revisions due to infection were reported in this large series. The ten-year cumulative rate of revision due to infection was seen to be 1.4% overall but was 3.1% for reverse shoulder arthroplasty. In the male population, a reverse shoulder conferred an 8% risk of revision at this stage. Younger male patients below the age of 65 years had a higher risk of infection. This was more so below the age of 55

years, where the adjusted relative risk was 2.58 compared with those patients over the age of 75. When compared with an indication of osteoarthritis, fracture and fracture sequelae conferred an adjusted relative risk ratio of 2.0 and 2.5, respectively. Rotator cuff arthropathy was also a relative risk factor for revision due to infection, with an adjusted relative risk of 2.95. Although the overall incidence of revision due to infection was relatively low, the registry data will underestimate the rate of actual occurrence of deep infection. The figures are useful for counselling of patients, and further efforts should be directed towards the identification of the mechanism by which some subgroups appear to be at more risk.

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Spine

Traumatic spinal implants: what do the biomechanics tell us? X-ref

■ Pedicle screws are commonly used to establish bony purchase in spinal fractures, and are able to

instrument all three spinal columns with low surgical risk. Short-segment fixation in spinal injuries (i.e. one level above and below the unstable segment) offers the advantage of sparing motion

segments and minimizing abnormal biomechanics. On the other hand, in some instances, a construct that relies on pedicle screws alone may not provide sufficient stability. Alternatives include