

# ROUNDUP<sup>360</sup>

## Wrist & Hand

**x-ref** For other roundups in this issue that cross-reference with *Wrist & Hand* see: [Trauma roundup 8](#).

### Dart throwing not quite as we thought

■ Biomechanics of the wrist doesn't sound terribly exciting, but a thorough understanding of the biomechanics (which are complex and highly controversial) has to be the starting point for a genuine understanding of any disease. A number of theories exist, all accounting for how the mid-carpal and radio-carpal joints move and transmit load. A lack of understanding has the potential to create mistakes in advice given in the clinical setting and expounded through the journals on how best to treat pathology and rehabilitate from carpal surgery. An area of ongoing and recent interest has been the dart throwing motion, specific to humans, which utilises the mid-carpal joint. Expounded by surgeons the world over and a favourite of the [Barcelona \(Spain\)](#) group, the theory goes that a wrist undergoing surgery to the proximal carpal row (e.g. scapholunate ligament reconstruction) can be mobilised early with the dart throwing action as the proximal carpal row remains immobile. In a complex but informative study, the research team correct their own previously published work (2008) and have a change of stance. The researchers undertook 3D motion scans of the moving wrist in 12 subjects (six normal and six with scapholunate ligament rupture). The pathology was confirmed by later surgery in all.

In the article, the authors describe a 'substantial' motion that occurs during dart throwing. In the normal wrists the dart throwers' motion did not result in flexion or extension of the scapholunate complex, just translation along the frontal plane (around 6 mm). However, the situation is different when a scapholunate ligament rupture is seen and the scaphoid translates towards the radial styloid, moving away from lunate (around 8 mm), inducing a scapholunate gap.<sup>1</sup> The study demonstrates a profound rotation of the scaphoid which occurs with an immobile lunate until pushed by the hamate i.e. dart throwing exercises after a scapholunate ligament repair will cause a disruptive force on the repair.

### Two-gear, four-bar linkage in the wrist?

■ Confirming our prejudice here at 360 that the carpus and its biomechanics may be more complex than they appear at first glance, a study team in [Adelaide \(Australia\)](#) have published work developing a computational theory of carpal constraint. The research team used complex computer modelling of wrist CT scans. The computer model was used to identify points of isometric constraint during movement (where the two points have constant relationships during movement). This was then used to develop the concept of a stable central column, a scaphoid lateral stabiliser of both carpal rows and a triquetrum restraining ulnar translation of the proximal row also resisting lunate flexion.<sup>2</sup> They

have described this as a 'two gear four bar linkage'. Perhaps slightly overly complex for clinical application at the moment, the concept itself, however, is interesting and the paper well worth a read.

### Assessing outcomes in distal radial fractures x-ref

■ Despite the combined talent of many bright researchers and surgeons, the assessment of outcomes following a fracture of the distal radius is still relatively tricky. Defining a good measurement of outcome still defies us. Radiological measures have poor clinical correlation, with radiological OA often being asymptomatic. Clinical objective parameters (range of movement, grip strength, etc) have fallen out of fashion recently, with patient-reported outcome measures like the Michigan Hand Outcomes Questionnaire (MHQ) becoming ever more popular.<sup>3</sup> We were intrigued to read this paper from [Ann Arbor \(USA\)](#) which attempts to establish the MHQ as one potential outcome measure to use in assessment of post fracture outcomes in the distal radius. The authors' collated data from 207 patients, all presenting with a fracture of the distal radius and outcomes (including ROM, grip strength, pinch strength and the MHQ) were collated at three and six months following fracture. Despite measuring a range of physical parameters, the authors were only able to attribute around 40% of the variation in the MHQ score. In order to fully understand outcome measures and improve interventions (both non-operative and operative)

to improve these outcomes, it is essential to understand where the remaining 60% of variation is seen – more work is definitely needed!

### Gold standard Swanson's?

■ The simple Swanson silastic PIP joint arthroplasty has defied generations of arthroplasty designers and is still very much in use and 'alive and kicking'. Two different papers have this month reported what some would consider to be 'Gold Standard' outcomes associated with this prosthesis. The gauntlet has certainly been laid down for the more expensive, complex and technically demanding alternative options. Researchers in [Richland \(USA\)](#) evaluated their own series of 51 patients who had undergone PIPJ arthroplasty (although only 38 joints in 22 patients were included in the analysis) on average ten years ago. Their outcomes were assessed with the QuickDASH and Likert rating scales. In this long-term outcome series the results were astoundingly good, with a 90% ten-year survival. Clinical outcomes were also good with an average pain VAS score of 0.4, and QuickDASH score of 17. These outcomes were despite apparently poor radiographic outcomes (31 deformed prostheses and 21 fractures).<sup>4</sup> In a related paper, researchers in [Zurich \(Switzerland\)](#) asked why these joints are revised and what happens if they are.<sup>5</sup> They conducted a cross-sectional study of patients undergoing Swanson's joint revisions over a ten-year period. They were able to report on 34 revision joints (in 27

patients) of which 24 were reviewed. Patients predominantly underwent revision for pain and implant fracture. Their ROM improved from 33° before the revision to 71° and only mild residual pain was seen in the majority of cases. It appears that revision of the Swanson's is a surprisingly effective and reliable operation even eight years down the line.

### **Multistrand repairs of unclear benefit in flexor tendon release**

■ There are almost as many papers on the best way to repair a flexor tendon as any other topic in hand surgery. It appears that there is no limit to the number of times residents will be prepared to attack a pig's trotter with a new suture or number of core sutures. This of course makes the topic ideal for a properly conducted systematic review. Collaborators from **Birmingham (UK)** have conducted just such a thorough systematic review investigating the evidence for, and outcomes of, flexor tendon repair techniques in the hand from zones 2 through to 5. The review team hypothesised that multistrand core sutures would have a poorer outcome than traditional two-strand techniques. Cadaveric and animal studies demonstrate the increased tensile strength of multistrand sutures but there are clinical concerns that the production of a possibly bulkier repair may inhibit gliding and therefore clinical outcomes. Their thorough systematic review encompassed 33 studies reporting results on two-strand repairs and 15 on multistrand repairs. They demonstrated a global rupture rate of 3.9% of repairs in a total of 3749 repaired tendons. Obviously papers reported a mix of outcome measures, however, with regards to the traditional and modified Strickland as well as ASSH and Buck Gramko Scores, the reviewers were unable to find any significant differences between any outcome measures and were thus unable to confirm their hypothesis.<sup>6</sup> Despite a significant focus in clinical and basic science literature, there is little evidence to

support one approach over another with regards to repair technique, and like so many things in medicine it falls to the clinician to make a sensible case-by-case decision.

### **For goodness' sake, leave the thumb alone in scaphoid fractures x-ref**

■ The optimal treatment of scaphoid fractures is becoming ever more controversial. While treatment in different types of plaster cast has been



previously the subject of randomised controlled trials, the transatlantic CAST Trial group based in **Amsterdam (The Netherlands)** decided to attempt to put the question to rest. They designed a randomised controlled trial (Level I evidence) with the aim of testing the null hypothesis that there would be no difference in scaphoid fracture healing in patients immobilised with either a standard below elbow cast or one including the thumb. Outcomes assessed in this study were fracture healing at ten weeks on CT, rather than just plain films, and symptoms which have been the focus of previous studies.<sup>7</sup> Traditionally, thumb spica-type casts have been seen as providing better immobilisation of the radial border of the carpus which has been thought to be essential in conservative treatment of scaphoid fractures. To obtain higher level evidence this study prospectively enrolled 62 patients and randomised them to the two immobilisation groups. At ten

weeks, outcomes were assessed with 3D imaging, and secondary outcome measures also included wrist movement and grip strength, as well as clinical scores (the Mayo Modified Wrist, the DASH score and the VAS pain scale). Interestingly, the authors found a significantly higher union rate at ten weeks in patients with excluded thumb immobilisation (85% vs 70%), however, the overall eventual union rate was 98%. There were no significant differences between groups for any of the secondary outcome measures. This study suggests improved healing rates in standard wrist-immobilising short arm casts for non-displaced scaphoid fractures and may stimulate some practitioners to change their method.

### **Horizons in carpal tunnel surgery**

■ Amazingly for a condition with a prevalence of around 4% to 5% in the general population, there is still much confusion as to how best to treat carpal tunnel syndrome. As the most commonly diagnosed and treated peripheral nerve compression syndrome, it is perhaps surprising that the higher incidence does not correspond to higher levels of evidence supporting recommendations on how to best treat this condition.<sup>8</sup> An insightful and carefully reasoned review by Michel Chammas from the CHU Lapeyronie in **Montpellier (France)** provides an excellent and detailed overview about the current state of the art in carpal tunnel syndromes. This comprehensive paper makes a worthwhile read for anyone wanting to immerse themselves in this subject. Anatomical variations pertinent to carpal tunnel surgery are detailed, as are the clinical diagnostic recommendations and surgical treatment. The author summarises that the surgeons' learning curve in performing minimally invasive procedures such as endoscopic or mini-open techniques may be justified by evidence to support quicker recovery times. The long-term results are, however, identical. On average, surgical results

are satisfactory in 90% of cases and a return to work is seen after two to three months, with only a 0.2% to 0.5% reported neurovascular complication rate.

### **Treading the Essex-Lopresti tightrope x-ref**

■ Up to 5% of fracture dislocations of the radial head can be associated with a complete rupture of the interosseous membrane (the so-called Essex-Lopresti lesion). The interosseous membrane doesn't just transmit load between the two bones but also maintains axial stability. Injury to the radial head and loss of integrity of the interosseous membrane leads to axial forearm instability and distal radioulnar joint dislocation. Since its first description by Essex-Lopresti, numerous treatment options aiming to restore longitudinal stability in the forearm have been described.<sup>9</sup> This technique's paper from **Kfar-Saba (Israel)** describes the use of a tightrope construct to restore interosseous membrane competency analogous to tightrope repairs of syndesmotic ankle injuries. The surgical technique is illustrated by the authors in a case report. The authors' technique attempts to restore the continuity of the central band of the IOM which courses at approximately 21° angled distal to the radius. The application of a tethering device to restore interosseous as well as proximal and distal radioulnar alignment is an appealing concept and it will be interesting to see more clinical data in support of this treatment modality for what, although a rare injury, can be devastating.

### **Wrist replacement in trauma? x-ref**

■ A suggestion not often heard at trauma conferences for patients with fractures of the distal radius is that of wrist replacement for comminuted fractures of the distal radius. This concept is unlikely to ever gain real momentum due to the excellent results of both non-operative treatments and fixation combined with the relatively poor long-term outcomes of radio-

carpal arthroplasty. Researchers in **Limoges (France)** did not, however, let this conventional wisdom put them off, and they present a retrospective study of eight patients with a mean age of 80 years. Amazingly, these patients were all treated for comminuted fractures of the distal radius with primary radiocarpal prosthesis. After 17 to 36 months (mean 25 months), all patients were followed up by an independent surgeon. Outcomes were assessed using wrist ROM and grip strength. Clinical outcome assessment included the Quick DASH (18.2; 6.82 to 29.55) and pain VAS (2.33; 0 to 4). As would be expected with such a short follow-up period, radiographs did not reveal any implant loosening or ulnar translation of the carpus. The authors cite one of the advantages of their wrist resurfacing implant as a rapid recovery and return to independent living in this group of elderly dependent patients. The authors' protocol required three weeks immobilisation in a cast followed by self-rehabilitation.<sup>10</sup> This is, to our knowledge, the only description of this treatment modality for fractures of the distal radius in the elderly and does appear to show early reported good results. While the indications for radiocarpal arthroplasty in

trauma of the elderly appear extremely limited, it may represent an attractive option for carefully selected active patients to keep in mind especially to those surgeons wishing to fly in the face of conventional wisdom.

#### **Radial shortening reliable in the long term for Kienbock's disease**

■ Kienbock's disease is something of an enigma, particularly in grade 3 disease where conservative treatments are unlikely to be successful and patients are unlikely to be satisfied with a fusion; in many centres these are treated with a wrist levelling procedure. A group of hand surgeons in **Sapporo (Japan)** have reported one of the few very long-term follow-up studies for Kienbock's disease. The authors report the outcomes of radial shortening osteotomies as a levelling procedure for Kienböck's disease which is a well-established technique recommended in 3A/B Lichtman stage pathologies. Although the authors only report the results of 11 procedures, follow-up is to a very impressive 14.3 years.<sup>11</sup> Clinical outcomes were quantified using a Japanese version of the DASH questionnaire and the modified Mayo wrist score. Additional imaging information in the form of

radiographic and magnetic resonance imaging studies were available for nine patients pre-operatively and all patients at follow-up. Nearly 15 years after their surgery, roughly half were asymptomatic (n = 6/11), with the remaining five experiencing mild occasional pain. The mean range of extension and grip strength significantly improved, as did the mean modified Mayo wrist score and Japanese DASH score. While there was no progression of the Lichtman stages, three wrists did not demonstrate any improvement in the lunate on MRI scanning. This study demonstrates that unloading of the lunate may have long-term beneficial clinical results despite ongoing pathologic-appearing MRI findings.

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