The non-operative management of hand fractures: a review

Grey Giddins

Most hand fractures can be successfully treated non-operatively. Some injuries such as contaminated open fractures or combined injuries e.g. requiring flexor tendon repair need operative treatment. The blood supply of the hand means that almost all fractures treated non-operatively heal with bone and most of those that do not are minimally symptomatic as the hand is not primarily weight bearing.

Spiral or long oblique metacarpal fractures

Spiral or long oblique metacarpal fractures can be treated with a range of surgical techniques; comparably good results have been reported with operative and non-operative treatment. All spiral metacarpal fractures, even with initial malrotation, can be treated non-operatively with very good outcomes and minimal morbidity. The patients were treated with early mobilisation without a splint or plaster and specifically encouraged to make a fist from the first outpatient visit to correct any malrotation and ensure early mobilisation. Twenty-five of 30 patients reviewed at a minimum follow-up of six months had full movement, grip strength of at least 90% of the other hand and only minimal malrotation in one patient and mild discomfort in another.

Malrotation following spiral metacarpal fractures almost always corrects with finger flexion. If it does not, then encouragement or manipulation under local anaesthetic would be appropriate, as the key aims of treatment are full movement avoiding rotational malunion.

The risk of dysfunction caused by shortening of the metacarpals with non-operative treatment has been raised. A recent biomechanical study has suggested that shortening up to 5mm is not significant; this fits with the results of Khan and Giddins.

Transverse metacarpal fractures of the fingers

Historically, patients with transverse metacarpal fractures of the shaft and especially the neck (boxer’s fracture) were left to mobilise freely. They usually healed with some deformity but good function. Barton established the role of a short plaster or splint to reduce the angulation of transverse metacarpal shaft fractures. The results of surgical treatment are also typically very good. There is a trade-off of angulation (non-operative treatment) versus the risks of surgery and a scar. A key question is therefore: “what degree of malunion is ‘acceptable’?”. The answer is unclear. For metacarpal neck (boxer’s) fractures there have been various recommendations: 50° to 60° flexion; 30°; and 20°. For little finger metacarpal shaft fractures, 30° has been considered acceptable. But these are only expert opinion. A Cochrane review has shown there is no good evidence that more marked malunion causes reduced hand function or creates unacceptable deformity.

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Westbrook et al. compared 105 metacarpal neck fractures treated non-operatively vs 18 treated operatively (13 with intramedullary k-wiring and five with plating); and 113 metacarpal shaft fractures treated non-operatively vs 26 treated operatively (four with k-wiring and 22 with plating). At a minimum follow-up of two years there were no differences in DASH score, grip strengths or aesthetics but a significant complication rate following surgery. Follow-up rates were, however, low (17% for non-operative treatment and 54% for operative treatment). A randomised study on metacarpal neck fractures has suggested that surgery may be very slightly better than non-operative treatment, primarily in giving better cosmesis due to less angular malunion. Strub et al. reported two groups of 20 patients who were pseudorandomised to intramedullary (bouquet) wiring (requiring two operations each for insertion and removal of the wires) or non-operative treatment with early mobilisation. The only complications were in the operative group which had more dissatisfied as well as more very satisfied patients. This study did not address patient inconvenience or patient/healthcare costs.

**Finger proximal phalanx collateral ligament avulsion fractures**

Bekler et al. noted that avulsion fractures of the bases of the phalanges are challenging injuries to treat but also stated that: “Avulsion fractures of the bases of the phalanges are intraarticular according to their configuration and need anatomic reduction” (a common but largely unproven myth in the hand). Other authors have also recommended that all base of finger avulsion fractures should be treated surgically because of the high rate of symptomatic non or delayed union, yet early protected mobilisation gives very reliable results at a mean follow-up of 57 (range 8-94) months. The available data are limited as these are small series often with limited follow-up. The dichotomy with the experience of Shewring and Thomas who reported symptomatic delayed union in eight consecutive patients and the excellent results of Sawant et al. in seven patients may be that many of these injuries often do not unite with bone (as for thumb metacarpophalangeal joint ulnar collateral ligament avulsions) but heal with sufficient stability that surgery is not required. Currently, the evidence suggests the results with non-operative treatment are reliable so that should be the first line of treatment.

**Thumb metacarpophalangeal joint avulsion fractures**

**Ulnar collateral ligament injuries:**
The outcome of thumb metacarpophalangeal (MP) joint avulsion fractures is disputed. A Stener lesion whether or not there is a bony avulsion will give a poor outcome with non-operative treatment. Some authors have reported poor outcomes with non-operative treatment of ulnar collateral ligaments avulsion injuries: Dinowitz et al. reported on nine cases with minimally displaced fractures treated in plaster within six days; all reported persistent pain which largely resolved following surgery. Kuz et al. reported 30 patients treated non-operatively. All were reviewed by questionnaire; 20 were seen in person. Nineteen of the 30 had no pain; all reported being satisfied by their treatment and none had changed jobs. The 20 assessed in person had no reduction in pinch or grip strength but two had some instability. They reported a non-union rate of 25% (5 of 20). Sornette and Goodwin reported 28 cases of avulsion fractures stable at original assessment treated with immobilisation in plaster for six weeks and followed up for a mean of 2.5 (range 1-4) years. They reported that 26 of the 28 had no pain on movement and no reduction in pinch and grip strength yet radiologically 80% had non-union. Comparable surgical results have been reported. Current evidence indicates that stable bony avulsions can be safely immobilised in plaster with the expectation of a good outcome.

The treatment of unstable injuries is less clear with surgery the current default position. But, as so often, the data are inadequate. There are a range of different types of thumb ulnar collateral ligament avulsion injuries from small bony avulsions i.e. primarily a soft tissue problem to large rotated bony avulsion fragments. This is likely to be an injury with subtypes that will benefit from surgery and others that will not; this remains unproven.

**Radial collateral ligament injuries:**
There are fewer reports of the treatment of radial collateral ligament (RCL) injuries. As there is no adductor hooed to cause a Stener-type lesion non-operative treatment should work well, i.e. immobilisation in plaster for 4-6 weeks. The role of surgery is debated. Mildly displaced RCL avulsion fractures treated non-operatively usually achieve a very good outcome. The role of surgery for more widely displaced or unstable injuries is unclear. Some authors believe that surgery is required on the basis
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that “considerable displacement of torn ends can prevent the RCL from healing” (another unproven belief). Currently, there is no good evidence that operative treatment of these injuries is superior to non-operative treatment.

Bony mallet injuries

There are many papers reporting techniques for reducing and holding the dorsal avulsion fracture fragment in bony mallet injuries. This is an operation with an acknowledged high risk of complications, although less so more recently. Reasonably consistent good results are reported for various surgical treatments of bony mallet injuries with a dorsal fracture fragment of 1/3 or more. The recommendation to treat fractures of 1/3 or more has come from a number of authors. The aim of surgery is to prevent subluxation of the main distal phalanx fracture fragment. What degree of subluxation (>2mm?) needs to be treated is unproven although some cases do progress to symptomatic dislocation.

In one of the most widely cited papers the authors reported that amongst patients with dorsal fracture fragments of over 1/3 followed-up for a mean of 3.25 years the 15 patients treated non-operatively did as well as the six treated operatively. Webhe and Schneider noted no difference between operative and non-operative treatment in rates of radiographic OA. Other authors have reported rates of DIP joint OA up to 50% yet some of only 0%. Almost certainly their criteria (which are rarely reported) differ, making comparison difficult. The risk of radiographic OA would be a potential concern except that long term symptomatic degenerative arthritis in the DIP joints is rarely seen in patients who have had bony mallet injuries, i.e. as orthopaedic surgeons we rarely see patients requiring treatment for symptomatic DIP joint arthritis who had bony mallet injuries decades earlier.

A Cochrane review reported that there was a paucity of good studies and no evidence that surgery was better than non-operative (typically splint) treatment for all types of mallet injury. They did, however, acknowledge that there may be a subgroup of these injuries that would benefit from surgery. The main area of concern is when there is a large fracture fragment ≥ 1/3 of the articular surface on the lateral radiograph with secondary volar subluxation of the main distal fracture fragment of the distal phalanx. Recent work has shown that the risk of subluxation can be predicted reasonably reliably with a lateral hyperextension radiograph performed within 1-2 weeks of injury. If there is “gliding” of the distal phalanx (Figure 1) i.e. it remains congruent into extension then this is stable. The presumption...
is that there has not been so much collateral ligament injury that subluxation will occur. If there is “pivoting” (Figure 2) then subluxation will usually occur, although this may only be mild. There is a third intermediate type “tilting” which probably behaves like gliding (Figure 3). The data further narrow the indications for surgery. Again, most patients do not need surgery but there is a clear subgroup that should benefit.

Discussion

There are many problems with the existing literature: a lack of RCTs; bias in many of the studies; and often incomplete data or outdated reporting of outcome. In addition, whereas operative treatments may be well described, there is often little detail about non-operative treatment. The quality of the follow-up almost certainly varies greatly. The outcome of and indications for non-operative treatment also depend upon other factors such as clinic availability, patient availability (some have to travel long distances making regular follow-up difficult) and therapy.

Nonetheless the available data suggest that for the above fractures surgery does not reliably confer benefit over “good” non-operative treatment. As surgery typically costs more both in patient risk and healthcare costs, non-operative treatment should be the default position for these fractures accepting the need for clinical judgement for individual cases. In time, there may be newer techniques allowing much earlier return to function with lower risks that may supersede non-operative treatment.

The dichotomies of different authors recommending such radically different treatments may have occurred for a number of reasons: surgeon preference/ bias; misunderstanding of the pathophysiology of the injury; over-reliance on biomechanical or cadaver studies which may not apply in clinical practice; an over-emphasis on bone union which may not affect outcome; and the variability of the injuries such that a sub-group of each pattern of injury does poorly with non-operative treatment skewing the perceptions of the outcome of treatment.

As reported for paediatric fractures in BJJ 360, non-operative treatment risks being forgotten. In light of the Montgomery ruling by the Supreme Court, surgeons need to be aware of how well many fractures do with non-operative treatment and that offering surgery requires very detailed consent. In addition, we should focus our future research efforts on areas where we might make a significant difference ahead of tackling those with marginal gains. Different patterns of displaced phalangeal fractures and proximal inter-phalangeal joint fracture subluxations or pilon fractures are two topics where the optimal treatments are very unclear and where research could make a considerable difference.

Prof Grey Giddins is an Orthopaedic and Hand Surgeon in Bath. He works as a team of three hand surgeons within the Orthopaedic department in Bath. He has a particular interest in the natural history of common conditions especially hand fractures in an effort define more clearly the problems that benefit from surgery and vice versa. He is also researching in distal radio-ulnar joint stability and arthritis, mechanisms of falling and avoidance of wrist injury, and hand and wrist biomechanics. As well as a Council member of the BOA he is currently the Editor-in-Chief of the Journal of Hand Surgery (European) and will next year be the President of the BSSH.

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References can be found online at www.boa.ac.uk/publications/JTO or by scanning the QR Code.
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