

ROUNDUP³⁶⁰

Wrist & Hand

Cost effectiveness of Dupuytren's surgery

■ Despite the myriad of treatments available for Dupuytren's disease, there have been no clear health economic studies to support the use of one particular treatment over another. In severe Dupuytren's, the treatment pathway is perhaps clearer than in mild single digit disease. In cases of single digit disease there is a distinct trade-off between the cost of treatment, side effect profile and recurrence rate. While each treatment is clearly defined in terms of efficacy, costs and side effects, to date there has not been a cost-utility analysis comparing the treatment modalities. The current literature supports three treatments for single cord, single digit disease with mild to moderate contracture. Fasciectomy offers a low rate of recurrence and longer time to recurrence, while there is an increased risk of complications, and indirect costs (linked to patient recovery and loss of income) are high. In contrast, aponeurotomy (also known as percutaneous needle fasciotomy) has a low risk of complications and follow-up, with minimal direct and indirect healthcare costs, however, it is only indicated for a single cord and there is an increased risk of recurrence. Injectable collagenase has the advantages of the percutaneous needle aponeurotomy, but may also offer lower recurrence rates, albeit with increased healthcare costs. Researchers in **Toronto (Canada)** have used the cost-utility approach to establish the most cost

effective treatment approach for mild Dupuytren's disease. Using single digit Dupuytren's disease as their model, the team used a cost-utility approach to establish the health economic value of each treatment. Initially they developed an expected value decision model to compare the expected cost effectiveness of fasciectomy, aponeurotomy and collagenase treatments. The team set the cost-effectiveness threshold at \$50 000 to \$100 000 per QALY gained (which is a standard threshold). Each treatment was evaluated in terms of cost effectiveness, one-way sensitivity and variability. The authors based their utility analysis on nine papers, including health economic data surrounding the treatment of Dupuytren's disease, and included health economic and complications data. Their comprehensive analysis included patient-incurred costs (ranging from parking charges to loss of income), hospital-incurred costs and the costs of treatment of any complications. As would be expected, the open fasciectomy was the most costly procedure with a total cost of \$7957, but collagenase treatment was not far behind (\$6442), with percutaneous needle aponeurotomy costing just \$3990. The majority of the cost difference between needle aponeurotomy and collagenase was the cost of the collagenase itself (costing around \$3000 for a course of treatment). The authors note that surgical treatment is dominated in their model, and that due to the excess

costs the recurrence rate determines benefit, however, even with a recurrence rate of 0%, open surgery was not cost effective for single cord disease in Dupuytren's contracture. However, the review authors are at pains to point out that surgery is the only option for many patients (those with multiple digit involvement, severe contracture diffuse disease, painful nodules, etc).¹ The authors conclude that percutaneous needle aponeurotomy is the most cost effective way of treating Dupuytren's contracture in a single digit, and this cost effectiveness improved when also used to treat recurrence. While the collagenase injections do confer some benefit, they are only cost effective at \$875 per treatment, and a cost of \$470 per treatment would be required to establish this treatment as standard of care. While here at 360 we dislike making decisions on patients' treatment modalities based on cost as much as any other clinician, in some circumstances this can be the most effective way of making decisions, and this study certainly sets a 'value' on the increased (but limited) benefit offered by collagenase injections.

A 'new horizon' in distal radius imaging

■ As the application of distal radius volar locking plates continues to explode, like many others, our hand surgeons and traumatologists here at 360 HQ report a continued high rate of usage. Although opinions differ concerning the precise indications and we have yet to see a definitive

study demonstrating that patients do indeed benefit from the new technology, there are plenty of studies highlighting the potential pitfalls in distal radial fracture plating. One of the most commonly reported complications (and in our experience the one which provokes the most complaints) is extensor tendon attrition, with both synovitic symptoms and tendon rupture reported in up to 6% of patients. This of course should be a completely avoidable complication, however, despite meticulous surgical technique, misleading radiographs (and combined with a complex shape to the distal radius) still result in a relatively high rate of this unwanted complication. Recent reports of both an oblique lateral view and dorsal horizon view have highlighted the potential to detect these penetrating screws intra-operatively. Researchers in **Innsbruck (Austria)** set out to establish which of the two views were most successful in detecting proud screws. They designed a cadaveric study using six cadavers (mean age 78, two male and four female) with uninjured distal radii. A variable angle distal radius plate was applied to the uninjured bone and the ideal screw lengths identified under direct vision. Horizon views were taken sequentially between 5° and 45° in 5° increments, and then the screws swapped out for ones 2 mm longer. The X-rays were repeated and the apparent length of screw tip perforation measured. A subsequent CT scan was also performed and the

same arrangement of views with different 3D reconstructions was also performed. As is standard with experiments of this nature, the X-rays and scans were reviewed by two observers independently and screw perforation measured. The most accurate position for detection of screw perforation is with the elbow in 75° of flexion with the image intensifier orthogonal to the floor. This gives a correlation co-efficient of 0.74 between actual and observed screw position, a better estimation than obtained by CT scan. The difference in perceived difference in screw length on the CT scan (where screw length was consistently overestimated) is due to the 'blooming' effect where high radiodensity objects appear bigger on CT.² This is a little gem of a study and demonstrates this to be the most effective technique for estimating screw length, and additionally describes with clarity how best to obtain the radiograph. Although originally described elsewhere, this paper adds a lot to our understanding of how best to avoid dorsal cortical penetration with our screws.

Undisplaced means undisplaced

■ It is common practice to closely monitor patients suffering with a distal radial fracture, particularly if the patient has undergone a manipulation or operative intervention. As the swelling in the cast subsides and the patient becomes more active, there is plenty of evidence that displaced fractures tend to settle back to their original position. Some clinicians routinely monitor previously displaced as well as undisplaced fractures, where others monitor only those who have had an intervention and reduction. Weekly visits for consultation and radiographs carry with them a health-care burden and health economic costs, and there is no evidence to support the practice of regular review for patients suffering an undisplaced fracture. Researchers in **Boston (USA)**, reasoning that it seems unlikely that undisplaced fractures would require regular review, conducted

a prognostic study to establish the likelihood of re-intervention following an undisplaced distal radial fracture. This retrospective database study selected 82 patients from a database of 642 consecutive closed distal radial fractures who sustained completely undisplaced fractures treated over a four-year period. The radiographs were evaluated at the time of injury and at the time of eventual fracture union to establish the fracture



displacement over time. Of the 82 patients in the study cohort, no patients required operative intervention or displaced significantly. The research team noted a mean displacement of radial inclination of 0.8° (max 3.6°), radial height 0.5 mm (max 2.1 mm) and an average loss of 1.0° of dorsal angulation.³ The authors make the none too controversial conclusion that undisplaced distal radial fractures are inherently stable and close follow-up is a waste of medical resource.

The mystery of the distal radial fracture continues

■ Sorting the sense from the senseless in the distal radial fracture literature can be a real challenge at present; the number of conflicting and unclear reports continues to rise and even the most seemingly straightforward clinical decisions can sometimes be hard to base in a reliable consensus of evidence. There have been a number of papers published recently that certainly merit the attention of the 360 readership.

How thick is thick enough?: articular cartilage step off revisited

■ One of the guiding principles of operative treatment of intra-articular distal radial fractures is that the acceptance of an articular step off of > 1 mm can result in poorer clinical results. The landmark (and now very controversial) paper by Knirk and Jupiter back in 1986 suggested that radiographic arthrosis correlated to articular step offs of > 1 mm. Reasoning that this is likely due to another oft-quoted guiding principle of intra-articular fracture surgery (that articular surface step off must not be greater than the width of the articular cartilage in any joint), this intrepid group of researchers set out to add anatomic weight to a paper now over 25 years old. The research team from **Baltimore (USA)** conducted a cadaveric anatomical study with the aim of establishing the articular cartilage depth at the distal radius. The surgeons used 19 cadaveric wrists and used multiple slices of each radius to measure the articular cartilage depth directly at the scaphoid and lunate fossae and along the interfossal ridge. The study team noted a mean cartilage depth of 0.6 mm, with the majority of cartilage > 1 mm in all measured areas. The maximum recorded thickness was 1.1 mm and 98% of measurements demonstrated cartilage depths of < 1 mm. The authors hypothesise that their study provides further evidence that "step offs of > 1 mm result in radiographic signs of arthritis. This provides further evidence linking the thickness of articular cartilage to radiographic outcomes and, possibly, clinical outcomes".⁴ There are of course no clinical data presented here, and the basis for their assertion is the oft-quoted Knirk and Jupiter paper⁵ which correlated radiographic arthrosis with increasing step off over 1 mm. So, slicing up cadaveric wrists is being used here to further the argument that all distal radial fractures should be treated aggressively, and this means internal fixa-

tion. A rather giant leap of published faith, especially when it has been clearly established that radiographic changes correlate poorly with clinical results.

Is the midcarpal joint more important than we think?

■ For us here at 360 HQ perhaps the most useful thing this study has done is to reignite an old debate. The same issue of *Journal of Hand Surgery* carries a thoughtful commentary from Marc Garcia-Elias,⁶ who points out that given the number of patients whose distal radial fracture has a > 0.6 mm step off (we seriously doubt here at 360 that we are able to come close to a 0.6 mm step off in our joint reductions in elderly osteopaenic bone), it is amazing that hand clinics are not full to bursting of patients with advanced radio-carpal arthrosis. He goes on to make some extremely interesting points in his commentary, and in particular notes that the majority of movement for most daily activity is at the midcarpal joint (especially the so-called 'dart throwing action' unique to man). The current literature would support the assertion that groups of patients who choose nonoperative treatment can do better than those choosing an operation, and the radiocarpal joint appears to compensate better for fracture displacement than in other areas.

Plates and Kirschner wires

■ Inherently, most orthopaedic surgeons seem to have a distrust of K-wire techniques. Perceived as unreliable and only able to maintain a semblance of stability, the use of K-wires has dramatically reduced over the past few years with a massive rise in the use of volar plates for displaced intra-articular radial fractures. If it really is critical to restore the joint to within 0.6 mm, one would expect the functional results to be compromised. Researchers in **Oslo (Norway)** have this month published the results of their study investigating the outcomes of distal radial fractures treated with either a distal radius plate or Kirschner wires. The study team

designed a randomised controlled trial involving 130 participants, and followed up over a year. Patients with an isolated distal radial fracture (either intra- or extra-articular) were randomised to either treatment methodologies and outcomes were assessed with both the patient outcome measure (PEM) and QuickDASH score. At a year's follow-up 95% of patients were available for review. Patients in the plate group had significantly better QuickDASH scores and grip strength at six weeks, but these differences had disappeared by three months. There were very few significant differences at final follow-up between the groups, with the plates demonstrating slight advantages with mildly increased supination (4°) and ulnar variance (1.1 mm versus 2.8 mm). Complication rates were similar, but 15% of plates needed later removal. QuickDASH was not significantly different between the groups.⁷ These results are almost identical to a similar study reported at the OTA in 2011⁸ and really do call into question the current treatment strategy for the majority of these patients.

Better early results with an IM nail?

■ Not content with simply attempting to resolve the ongoing debate as to who should be operated on with a distal radial fracture and which patients do better with a plate, researchers in **Znojmo (Czech Republic)** have upset the apple cart even further with their own randomised controlled trial designed to test the efficacy of an intramedullary nail in distal radial fractures. Their trial randomised 62 patients with either extra-articular or simple sagittal plane intra-articular fractures to receive either a Micronail or Adaptive plate. Outcomes were assessed using radiographs (with standardised criteria) and clinical outcomes (range of movement, DASH and Mayo wrist scores). Patients attended for both clinical and radiographic assessment at six weeks, and then three and six months. In a commonly reported outcome (see both RCTs evaluating distal radius plates and K-wires above), the intramedullary nailing group got off to a flying start with better performance at the six-week mark.

These early differences had however disappeared by three months.⁹ The authors of this study conclude that (despite no differences in their stated primary outcomes at their study's follow-up interval) the intramedullary nail group has advantages over locked plating as patients report better earlier outcomes. However, we would emphasise here at 360 that this sort of intervention is not suitable for complex distal radial fractures. Far from increasing our clarity about what to do with distal radial fractures this study has just confused us further. The plot, as they say, thickens.

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