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Letter to the Editor

Estimation of radiographic measurements in fracture distal radius. Should we be using digital measuring tools?☆☆

Sir,

Immediate management of fractures of the distal radius may include manipulation under anaesthetic (MUA), to restore a more anatomical position and aid functional recovery. The decision to manipulate is often an empirical one, made by assessment of fracture characteristics such as angulation, often estimated visually. We assessed the accuracy of estimations of fracture angulation by all orthopaedic and emergency medicine staff in two hospitals, and found a marked discrepancy between estimated and measured angles.

Sixty-one members of staff at two hospitals, who regularly manage distal radius fractures, were asked to view a prepared series of 13 radiographs of distal radius fractures with varying degrees of anteroposterior tilt (range 7.1°–38.7°, mean = 23°).

The participants included 31 orthopaedic staff (13 junior doctors, 12 middle grade, and 6 consultants) and 30 staff from Accident & Emergency (10 junior, 7 middle grade, 4 consultants, 9 emergency nurse practitioners (ENPs)).

Participants were asked to visually estimate the degree of AP tilt based upon the angle of the articular surface of the radius relative to neutral. They were blinded to each other's answers. The same angles were then measured by the authors using the Cobb angle tool on radiographic viewing software (Centricity PACS, GE Healthcare), by drawing one line down the centre of the shaft of the radius, and another at 90° to it to represent neutral, followed by a second Cobb angle between the 'neutral line' and a line drawn between the edges of the articular surface of the radius.

An unpaired t-test provided significance of difference between groups (Prism 5 for Macintosh, Graphpad Software, La Jolla, CA 92037). Pearson's correlation coefficient (*r*-values) was calculated using the tool in Microsoft Excel 2008 for Mac.

The mean difference between estimated and measured angles varied between 4.36° and 26.12° across all participants (Overall mean 10.52°; Standard Deviation (SD) 10.09). A trend of increasing accuracy was seen with increasing seniority of participant. Estimates by orthopaedic specialists (mean

difference 8.40°, SD 7.43) were generally more accurate than those by A&E doctors (mean 12.68°, SD 11.92; *p* = <0.0001), who in turn were generally more accurate than ENPs, though not significantly. A positive correlation was found between speed of making estimates and accuracy; *r* = 0.42.

Twenty-three out of 61 participants (38%) reported routine use of the angle measuring software tool when managing distal radius fractures. Those who used the tool routinely were found to be more accurate than those who did not (mean 9.68° and 11.11° difference from measured angle respectively; *p* = 0.05).

The anatomical position of the distal articular surface of the radius is approximately 11° of volar angulation. Fractures with angles of 0° from neutral may be considered functionally normal.¹ It has been recommended that fractures be manipulated if there is 10° or more of dorsal tilt from neutral,² and angles greater than 20° dorsal tilt may result in pain at the radiocarpal articulation and limited grip strength if untreated.³

Despite variation in accuracy between different grades and specialties, the present study showed an overall mean discrepancy of 10.52° between estimated and measured angles. We therefore suggest that if the decision to undertake MUA is based on fracture angle, digital angle measuring tools in radiographic viewing software be used where available. This may avoid the potential for manipulating those that may be accepted in their pre-intervention position, or 'missing' fractures that would benefit from manipulation, and may help assess the adequacy of reduction post-manipulation. Documenting a pre-manipulation angle in patient notes may be useful to refer back to, if asked to justify the decision to undertake MUA should complications arise.

Our findings support those of a recent study also demonstrating poor accuracy of visual estimation of fracture angles,⁴ and also add that accuracy appears to improve with the level of exposure to fracture angles gained through day-to-day work.

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Conflicts of interest

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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