Surgical vs Non-surgical interventions for distal radius fractures: a quantitative analysis of Patient-Rated Wrist Evaluation measures

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Trials to assess differences in PRWE (Patient Related Wrist Evaluation) over time, for both surgical and non-surgical interventions post DRFs (distal radius fractures) are rare. The DASH (Disabilities of the Arm, Shoulder and Hand) questionnaire has been shown to be improved by a greater margin in the medium term for surgical interventions, than non surgical interventions. However, a study found that PRWE can be considered superior to the DASH questionnaire for DRFs, due to greater specificity to wrist pain and function. Conflicting data makes it difficult to determine surgical vs non-surgical superiority for DASH’s over time with PRWE as a recovery metric. PubMed and Cochrane were searched for randomised controlled trials up to 31.8.23, reporting PRWE over 3, and 12 months. Data was extracted by 2 researchers. The differences in PRWE over time post surgical and non-surgical interventions was assessed using unpaired T testing. 1226 records were screened. 4 studies enrolling 817 participants met the eligibility criteria and were analysed. Significantly lower PRWE in surgical intervention has been identified at the 3 month mark (p<0.001). There was greater significant change in non-surgical intervention between months 3 and 12 (p<0.001). Change in PRWE over time may be a good indicator of functional outcomes in DRFs post surgical or non-surgical interventions. This could inform future clinical trial design and surgical decision-making. Further work is required to design even more user-friendly and digital patient-reported outcomes specifically for DRFs.

Keywords: DRF, surgery, PRWE, non-surgical.

INTRODUCTION

Distal radius fractures (DRFs) are treated via different modalities. Non-surgical modalities are more common in elderly patients, with evidence increasingly showing its ‘non-inferiority’ to surgical fixation. However, operative treatment has been found to be more effective with greater effects on younger patients.

Common methods of quantifying function following an intervention are numerous, our research found two main measures: Disabilities of the Arm, Shoulder and Hand questionnaire score (DASH) and Patient Related Wrist Evaluation (PRWE). The PRWE was reported less frequently, despite its supposed superiority to the DASH. This superiority is attributed to greater specificity of the PRWE to DRFs, compared to the more general DASH. The PRWE is a questionnaire consisting of 15 items, used to score wrist related pain and disability in relation to function. We believe that PRWE has potential to be used frequently.

The purpose of this study is to compare the current literature regarding the use of PRWE when comparing surgical and non-surgical interventions after a distal radius fracture, and to come to a quantitative conclusion to assess a difference in PRWE over time between the two domains of treatment, as a proxy for function.

METHODS AND MATERIALS

Protocol + Registration

The intention was to study DRFs and the functional outcomes or PROMS (patient reported outcomes) over time - specifically PRWE. We were comparing surgical and nonsurgical treatment modalities.

Our study has been registered via PROSPERO, CRD:42023459150.

Electronic Search

Systematic searches for randomised control trials (RCTs) reported in English were performed by different researchers via PubMed and Cochrane, encompassing: CT.gov, Embase, PubMed and ICTRP (Figure 1). This
and nonsurgical interventions and data at the 3 and 12 month marks (Table 3). If papers had a reference to knees, ankles, hips or rotator cuff they were excluded. Our primary outcome was the PRWE score at 3 months and 12 months in patients with distal radius fractures

When extracting the data, we manually extracted mean and standard deviation data for the 3 and 12 month marks (Table 4). If this data was not available, we used median and interquartile range (IQR). All data was extracted into a spreadsheet.

We conducted a bias or quality assessment. Internal validity was assessed via the Revised Cochrane risk-of-bias tool for randomised trials (RoB 2) (figure 3,4).

When analysing the data, we used weighted means to combine individual study data and used unpaired T testing to compare the different measures of effect. Results were formed into a table (figure 2). The data analysis was performed via R software. All actions were completed with reference to the PRISMA statement.

RESULTS

A total of 1266 studies were found through the electronic searches (figure 2). Of these, four studies met the eligibility criteria and were included in the systematic review (Table 4). The kappa agreement rate between the reviewers was 1.00.

A summary of the included studies are presented in Tables 3, 4, 5 and 6. The overall population included 817 patients (416 in the nonoperative group and 401 in the operative group).
The included papers were assessed in 5 domains: randomisation process; deviations from intended interventions; missing outcome data; measurement of the outcome and selection of the reported result – there was then a final overall judgement (Figure 3,4). Each domain was scored on a scale of: low, some concerns...
When considering the effect size, overall pooled Cohen’s D estimate showed no significant difference in PRWE between nonsurgical and surgical groups (40.03 ± 23.34 vs 34.38 ± 23.83, respectively; p = 0.91) (table 5). When considering the effect size, the overall pooled Cohen’s D estimate showed no significant difference in PRWE between nonsurgical and surgical interventions at 3 months (D = 0.12, 95% CI = -2.04 to 2.28, p = 0.91), with no important heterogeneity (I² = 0%, p = 0.99) (figure 5).

A total of 1266 studies were found through the electronic searches. (figure 2) Of these, four studies included data to perform the systematic review and meta analysis for PRWE score at 12 months, measured using a 15-item questionnaire. The mean PRWE differed significantly between nonsurgical and surgical groups (18.85 ± 21.33 vs 18.00 ± 19.39, respectively; p < 0.001) (table 7). When considering the effect size, overall pooled Cohen’s D estimate showed no significant difference in PRWE between nonsurgical and surgical interventions at 3 months (D = 0.12, 95% CI = -2.04 to 2.28, p = 0.91), with no important heterogeneity (I² = 0%, p = 0.99) (figure 5).

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They were then assessed and scored by both researchers respectively and independently and then compared. We extracted the bias assessment table as a bar chart (Figure 4).

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Publication bias was not evaluated, since only four articles were included in this systematic review and meta-analysis.

**DISCUSSION**

The evidence in this study is derived from 4 peer-reviewed and published randomised control trials, comparing PRWE measures for surgical and non-surgical intervention in patients with DRF’s. This review attempted to quantitatively analyse and assess differences in PRWE, irrespective of sex, age and demographic factors. The studies analysed came from Australia and New Zealand, the UK, the Netherlands, and Sweden. Selected studies covered a large geographical area. All papers followed an intention-to-treat analysis in relation to PRWE.

The CROSSFIRE Study Group’s paper was an RCT and parallel observational study, consisting of 300 participants. The study itself focussed on 460 patients...
that were 60 years old and over. It encompassed 19 centres across Australia and New Zealand and had PRWE as one of the primary outcomes. Its conclusion of VLP (Volar plate) fixation offering no clinically important advantage over closer reduction at the 12 month mark was echoed in our own results, as surgical and non-surgical interventions had no significant difference at the 12 month mark, and further supported in a paper out of Sweden and a meta analysis out of China12,13. A concern, however, was that the CROSSFIRE Study Group’s Paper was at a self proclaimed potential risk of sampling bias as local surgical teams may not have offered participation for all eligible patients. Overall, this study was deemed to have a low risk of bias by both researchers and as such, we were happy to include it.

The paper out of the UK was a multicentre RCT9, consisting of 500 patients. The ages of those involved in the study was 16 and above, with the study being powered towards its primary outcome of PRWE at 12 months - its secondary outcome was PRWE data at 3 and 6 months. Just as with the CROSSFIRE Study Group’s study, no significant differences were found between the surgical and nonsurgical interventions (K-wire and a moulded cast respectively, with both groups involving manipulation of the DRF) at 3 months (p=0.82), 6 months (p=0.87) or 12 months (p=0.87). This study, however, lost about 20% of its patients to followup and as such has relatively narrow confidence intervals, but after analysis of the study by both researchers, it was deemed to have a low risk of bias overall. This paper was published in 2022 and was therefore considered to be up to date with the current data.

Wilcke MK et Al’s paper was an RCT based in Sweden involving 63 patients under the age of 70.11 There were two groups: surgical (volar locked plating, n=33) and non surgical (bridging external fixation n=30). They found that, at 3 months (p=<0.001) and 6 months (p=0.02), the operative group had significantly lower PRWE scores and no significant differences were found at the 12 month mark (p=0.3). This trend was also evident in the overall results from our study. The major limitation of this study is that the authors proclaimed that they feel their study may have been underpowered and as such did question if there was a significant difference at the 12 month mark too. After their retrospective power analysis. They found that 70-110 patients would be needed per group to make the 12 month PRWE differences – this would have required at least a 100% increase in sample size. This paper was still included in the overall analysis as the results were still considered valid by both researchers and Wilcke MK et Al.

Selles, C.A et Al’s paper was also a multicenter RCT10. It enrolled patients between the ages of 18 to 75 on the prerequisite that the DRF was, both,
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CONCLUSION

Lower PRWE at 3 months in the surgical group is indicative of better short-term improvement hence may be the advised therapeutic modality in those who require a quicker return to normal function. However, greater Δ PRWE between 3-12 months in nonoperative group is indicative of better medium-term improvement. Nonetheless there is need for more high-quality randomised clinical trials investigating surgical and nonsurgical interventions, which most importantly establish a PRWE score pre-treatment (i.e. a baseline). Future studies should include more patients, have longer follow-up times, and perform subgroup analyses regarding age, severity and type of treatment of DRF.

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Ethical approval: Not required.

REFERENCES


