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Original Research

The Effect of Immobilization Position on Functional Outcomes and Complications Associated With the Conservative Treatment of Distal Radius Fractures: A Systematic Review

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Purpose: We evaluated the literature on complications associated with different positions used for immobilizing the upper extremity during conservative treatment of distal radius fractures (DRF).
Methods: A search of PubMed, Embase, and Medline was conducted to identify original research on the effects that upper extremity positioning during the treatment of DRFs has on complication rates. Treatment groups were categorized by wrist positioning in flexion, extension, or neutral, as well as forearm positioning in pronation, supination, or neutral. The primary endpoints examined included the loss of reduction, recasting/refabricating an orthosis, and functional limitations.
Results: A total of 1,655 articles were identified through an initial database search. Ultimately, 8 studies, with 786 total patients, met the inclusion criteria for this systematic review. A qualitative analysis determined that immobilizing DRFs with the wrist in extension results in better functional and radiographic outcomes with lower rates of complications, such as pain, recasting, and the need for operation. The 2 studies that compared forearm pronation versus supination revealed contradictory results regarding which position was associated with superior outcomes. A meta-analysis comparing the various wrist and forearm positions failed to demonstrate statistically significant differences in the rates of loss of reduction or recasting/refabricating an orthosis between the groups. This analysis was limited by considerable heterogeneity in the data from the different studies.
Conclusions: Despite the high incidence of DRFs, there is limited research on the optimal position of immobilization for conservative treatment of them. Available evidence suggests that the wrist should be immobilized in extension, as these patients had improved functional and radiographic outcomes. No conclusion can be drawn from the existing literature on ideal forearm position during immobilization. This review also suggests better data reporting practices for studies researching DRFs, so that future meta-analyses can be more comprehensive.
Type of study/level of evidence: Therapeutic II.

Fractures of the distal radius are among the most frequently occurring fractures in the United States, with an estimated 643,000 cases per year.[1] The 2 groups of individuals experiencing the highest number of these fractures are young male athletes and females greater than 65 years of age.[2] Young male athletes typically experience distal radius fractures (DRFs) secondary to sports-related injuries, while low-impact falls on an outstretched hand are the most common in elderly females.[2,3]

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The goal of treating DRFs is to minimize complications, including loss of reduction, nerve injury, and pain, as well as to maximize return of function.[2] These fractures are most commonly treated nonsurgically. Various forms of casts or orthoses have been described, including above- and below-elbow circumferential casts, sugar tong orthoses, and dorsal orthoses. In addition, the position of immobilization can vary greatly, with studies evaluating the wrist in extension, neutral, or flexion and the forearm in pronation, neutral, or supination.[4] While researchers have explored how the position of immobilization during casting/orthosis fabrication affects outcomes, there is no consensus on optimal positioning for conservative management of DRFs to yield the greatest reduction in complications. For instance, the American Academy of Orthopaedic Surgeons'[5] Guideline and Evidence Report does not directly address the question of proper positioning for immobilizing DRFs. The British Orthopaedic Association and British Society for Surgery of the Hand[6] reviewed 2 manuscripts addressing optimal positioning, but neither met inclusion criteria for their guidelines.

The purpose of this systematic review is to investigate and compare the incidences of complications that arise from treatment of DRFs with differing positions of immobilization. A review of these data will hopefully yield information useful for providing optimal treatment with minimal complications for DRFs. We hypothesize that the best position (ie, fewest complications, greatest range of motion outcomes) for the immobilization of DRFs will be with the wrist in flexion and the forearm in supination, as this positioning theoretically best corrects for the displacement that results from the forced extension and pronation during a fall on an outstretched hand.

Materials and Methods

This systematic review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. The Emory University School of Medicine, the School of Medicine at American University of Integrative Sciences, and the Department of Orthopedic Surgery at Emory University approved the human protocol for this investigation, and all investigations were conducted in conformity with ethics principles of research. A search of PubMed, Medline, and Embase was conducted on November 11, 2020, to find articles related to the position of immobilization used to conservatively treat DRFs. Queried terms included "radius fracture," "distal," "nonsurgical," "nonoperative," "cast," and "splint." The full search details are included in the Supplemental Materials (available on the *Journal*'s website at www.jhsgo.org). Results of the search were uploaded into Covidence. Duplicate articles, articles not in English, and irrelevant articles were all removed. Additionally, articles in nonhuman subjects or cadavers were excluded. Case reports, reviews, meta-analyses, or commentary pieces were also excluded at this stage.

Through title and abstract screening, the authors included articles based on the following criteria: (1) the patient population was greater than or equal to 18 years old; (2) the indication for treatment was a DRF; (3) the study sought to elucidate the effect that the position of immobilization of the wrist or forearm has on treatment outcomes; and (4) the study provided data on anatomical, functional, or radiographic results.

Studies that met the above inclusion criteria were documented in an Excel workbook (Microsoft). All studies were evaluated and assigned a level of evidence based on the Oxford Centre for Evidence Based Medicine criteria. Original research studies designated higher than level of evidence 3b were eligible for inclusion in this review.

We used the Cochrane risk of bias tool to assess for the presence of bias due to randomization, missing data, outcome measurements, and selection of reported results in the included studies.[7] Of the 6 randomized controlled trials (RCTs), 5 had some risk of bias and 1 had a low risk of bias in their randomization protocols. Those that were designated as having some risk of bias in randomization were generally due to lack of information provided on the precise randomization methodology and an insufficient comparison of the treatment groups' baseline characteristics.[8−12] When the 8 included studies were assessed for bias due to missing data, 2 were determined to have some concern for bias[8,13] and 6 had a low risk of bias.[9−12,14,15] The studies that had some concern for missing data bias, those by Baruah et al[13] and Grle et al,[8] had high rates of loss of follow up, and it is unclear whether these rates could have been differentially affected by the position of immobilization for the patients. Of the 8 included studies, 7 used some form of patient-reported scoring system for pain or functional outcomes, yielding at least some concern for bias in the outcomes measured.[8−11,13−15] All 8 studies had a low risk of bias from the selection of reported outcomes, as they used prespecified outcomes and did not preferentially choose data analyses that would influence results.[8−15]

A data charting form was created to chart demographic data and treatment outcomes, including patients' age and sex, the incidence rate of complications (eg, loss of reduction, pain), and radiographic measurements (eg, dorsal angulation, radial height). Studies that assessed different positions of immobilization underwent 2 analyses. First, the studies were sorted by wrist position during immobilization and were divided into wrist flexion, neutral, and extension (dorsiflexion) groups. Next, the studies were sorted by forearm position and were divided into pronation, neutral, and supination groups. For wrist immobilization, a neutral position was defined as 0° of flexion or extension. In cases where the forearm was not immobilized, these patients were classified as being in a neutral position, because recent evidence suggests that even below-elbow constructs significantly limit rotational range of motion.[16] The first, second, and third authors (Jamnik, Pirkle, and Chacon, respectively) were responsible for independent study selection and data collection.

Frequency-weighted statistics were used to compare different treatment groups. An analysis of variance (ANOVA) was performed to determine the presence of differences between treatment groups, and a Tukey test was used to identify the groups where differences occurred. The alpha value used for statistical significance was 0.05 in all cases.

Results

The results of the database search are provided in the Figure. Eight studies with 16 treatment groups were ultimately selected for inclusion in this systematic review. In total, these groups were comprised of 768 patients with a frequency-weighted mean age of 55.4 years (range, 18−94 years). Of the studies that provided information on the distribution of patients' sex, 69.2% of patients were women and 30.8% were men. All fractures underwent closed reduction prior to immobilization, the technique did not vary between treatment groups in each individual study. For 6 of the studies, the patients were immobilized in the final treatment position immediately after reduction.[8−10,12−14] In 2 of the studies, all patients were immobilized in an above-elbow cast in supination and moderate wrist flexion immediately after reduction. They were then converted to the final treatment position approximately 1 to 11 days later.[11,15] Study-specific demographics and treatment protocols are provided in Table 1.

Of the 6 RCTs, 5 performed some form of comparison of the baseline fracture severity. Rajan et al[10] provided information on the radiographic features of the fractures (eg, radial and palmar tilt)

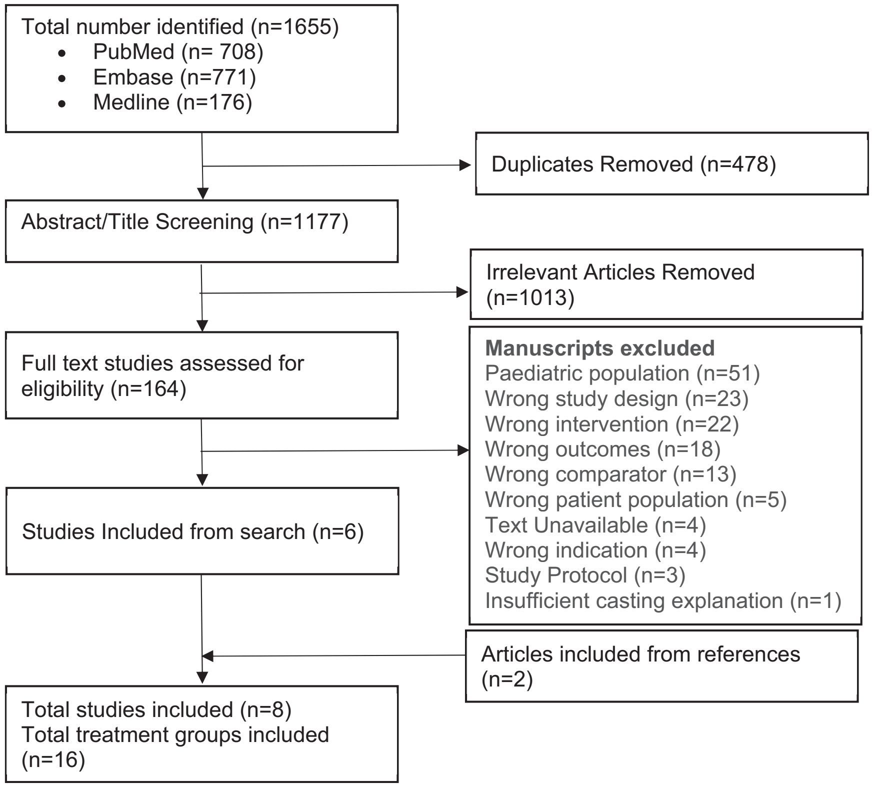

Figure. Flow diagram representing the search strategy for inclusion and exclusion of articles in this systematic review based on the Preferred Reporting Systems for Systematic Reviews and Meta-Analysis guidelines.

Table 1
Details of Included Treatment Groups[*]

Author, Year	Type of Study	Level of Evidence	Fracture Types Included	Type of Cast/ Orthosis	Duration of Immobilization	Wrist Position	Forearm Position	Total Number of Patients	Mean Age	Age Range, Minimum	Age Range, Maximum	Female	Male
Grle et al, 2017[8]	RCT	1b	Extra and Intra-articular	Dorsal plaster orthosis	4 weeks	20° Extension	Pronation	50	63.48	25	–	–	–
						20° Flexion	Pronation	50	64.2		–	–	–
Gupta, 1991[9]	RCT	1b	Displaced, extra and intra-articular	Below-elbow cast	6 weeks	Extension	Neutral[†]	69	46	18	74	122	82
						Flexion	Neutral[†]	60	46				
						Neutral	Neutral[†]	75	46				
Raittio et al, 2020[14]	RCT	1b	Extra and Intra-articular	Below-elbow cast	5 weeks	0°–20° Extension	Neutral[†]	50	74.6	65	94	44	6
						Flexion	Neutral[†]	55	72.6		89	48	7
Rajan et al, 2008[10]	RCT	1b	Extra-articular	Below-elbow cast	4 weeks	15° Extension	Neutral[†]	34	–	20	60	36	28
						15° Flexion	Neutral[†]	30	–		60		
Sarmiento and Latta, 2014[11]	RCT	1b	Extra and Intra-articular	Above-elbow cast	–	Flexion	Supination	78	-–	–	–	–	–
							Pronation	78	–	–	–	–	–
Wahlström, 1982[12]	RCT	1b	Extra-articular	Dorsal plaster orthosis	–	Flexion	Neutral	12	67	40		12	0
						Flexion	Supination	16	64			16	0
						Flexion	Pronation	14	64			14	0
Baruah et al, 2015[13]	Therapeutic	2c	Extra-articular	Below-elbow cast	4 weeks	15° Flexion	Neutral[†]	54	–	19	–	31	23
Sarmiento et al, 1975[15]	Therapeutic	2c	Intra-articular, Comminuted	Orthoplast brace	–	Flexion	Supination	43	–	20	82	31	12

[*] A dash (–) indicates that the study did not provide the relevant information.
[†] Indicates that this position was assumed to be in neutral given the lack of a description otherwise.

before and after reduction. Grle et al[8] reported that their 2 treatment groups were similar at baseline, though they did not report the parameters or methods by which they tested for equality. Gupta et al[9] compared the proportion of patients in each treatment group that, at baseline, had fractures with comminution or articular involvement. Sarmiento and Latta[11] provided baseline rates of fractures that exhibited displacement and articular involvement. Raittio et al[14] also provided the number of fractures in each

Table 2
Comparison of Select Treatment Group Wrist OUtcomes for RCTs Wrist Extension/Flexion/Neutral[*]

Study	Upper Extremity Positioning		
	Wrist Extension	Wrist Flexion	Neutral
Grle et al, 2017[8]	*Range of Motion* Extension: 40.7° ± 15.29°[†] Flexion: 47.8° ± 16.39° Ulnar deviation: 24.1° ± 7.8°[†] Radial deviation: 11.5° ± 5.65°[†] *Radiography* Radial height: 10.41 mm ± 1.73 mm[†] Radial Inclination: 20.64° ± 4.43°[†] *Patient-Reported Outcomes* Short Form Suvery (SF-12) Physical Score (PCS): 43.1 ± 8.35[†]	*Range of Motion* Extension: 22.8° ± 19.04°[†] Flexion: 42.5° ± 21.07° Ulnar deviation: 16.0° ± 9.31°[†] Radial deviation: 4.8° ± 4.94°[†] *Radiography* Radial height: 9.34 mm ± 1.81 mm[†] Radial Inclination: 18.18° ± 4.63°[†] *Patient-Reported Outcomes* SF-12 Physical Score (PCS): 39.26 ± 7.00[†]	-
Raittio et al, 2020[14]	*Radiography* Ulnar Variance: 4.4[†] *Complications* Need for operative treatment: 8% of patients Reported pain: 9% of patients[†]	*Radiography* Ulnar Variance: 3.2[†] *Complications* Need for operative treatment: 13% of patients Reported pain: 26% of patients[†]	
Gupta, 1991[9]	*Radiography* Volar tilt: 1.8° Radial tilt: 3.3° Radial shortening: 1.5 mm	*Radiography* Volar tilt: 5.7° Radial tilt: 3.9° Radial shortening: 2.2 mm	*Radiography* Volar tilt: 4.2° Radial tilt: 4.8° Radial shortening: 4.8 mm
Rajan et al, 2008[10]	*Range of motion* Patients with dorsiflexion >45°: 100%[†] Patients with flexion >30°: 100% of patients[†] Patients with ulnar deviation >15°: 97.5%[†] Patients with radial deviation >15°: 82.35%[†] *Radiography* Patients maintaining normal radial tilt (13°–33°)[‡]: 73.52%[†] Patients maintaining normal palmar tilt (1°–21°)[‡]: 67.64%[†] Patients maintaining normal ulnar variance (-2 mm to 0 mm)[‡]: 64.7%[†]	*Range of motion* Patients with dorsiflexion >45°: 43.33%[†] Patients with flexion >30°: 63.33%[†] Ulnar deviation >15°: 70%[†] Radial deviation >15°: 53.33%[†] *Radiography* Patients maintaining normal radial tilt (13°–33°)[‡]: 46.7%[†] Patients maintaining normal palmar tilt (1°–21°)[‡]: 30%[†] Patients maintaining normal ulnar variance (-2 mm to 0 mm)[‡]: 40%[†]	
Baruah et al, 2015[13]	*Radiography* Patients with dorsal angulation >10°: 22.2% Patients with loss of radial length >6 mm: 20.3%		

[*] All values represent the mean ± SD unless otherwise stated.
[†] Statistically significant.
[‡] Normal as suggested by the study.

treatment group with articular involvement, as well as baseline scores on the pain catastrophizing scale. Wahlström[12] did not compare baseline fracture severity between groups. None of the RCTs report the results of an analysis determining whether any observed baseline differences in fracture severity were statistically significant.[8–12,14] Data comparing the outcomes of the various treatment groups in the RCTs can be found in Tables 2 and 3.

Qualitative/descriptive analysis

Wrist flexion versus extension versus neutral

Four studies compared outcomes of immobilizing DRFs in differing wrist positions.[8–10,14] Grle et al[8] found that patients immobilized with the wrist in extension had significantly better range of motion and radiographic outcomes when compared to those immobilized in wrist flexion. Further, those immobilized in wrist extension had better self-reported functional outcomes in the physical component of an Short Form Suvery (SF-12).[8] Gupta[9] also found that immobilization in extension resulted in better functional and radiographic outcomes than immobilization in flexion or a neutral position, though they did not perform analyses to determine statistical significance. Raittio et al[14] compared patients immobilized with their wrist in flexion with those with their wrist in 0° to 20° of extension. They found that those in the extension group reported statistically significant less pain than those in the flexion group. They also had lower rates of cast changes and secondary operative treatment, though these differences were not statistically significant.[14] Similarly, in the study by Rajan et al,[10] patients immobilized in wrist extension exhibited better post-treatment range of motion, grip strength, and radiologic outcomes. In summary, all 4 studies that compared immobilization in wrist flexion and extension showed improved functional or radiographic outcomes when patients' wrists were placed in extension.

Forearm pronation versus supination versus neutral

Two studies specifically compared outcomes based on the forearm position during immobilization.[11,12] The results from Sarmiento and Latta[11] indicated lower rates of loss of reduction in patients treated with immobilization in supination when compared to those immobilized in pronation, though they did not perform analyses to determine statistical significance. Contrarily, Wahlström[12] found that the DRFs immobilized in pronation had lower rates of redisplacement than those in a neutral or supination position, with the latter difference being statistically significant.

Quantitative analysis

Many of the studies did not have comparable raw data, as they used different endpoints, provided the end results of scoring systems rather than the results of the individual metrics that comprise the score, or provided the incidence at which patients met various cutoffs (eg, number of patients that could extend their wrist greater than 45°). As such, an ANOVA was only performed on rates of loss of reduction and recasting/refabricating an orthosis. Outcomes by

Table 3
Comparison of Select Treatment Group Wrist Outcomes for RCTs Pronation/Supination/Neutral*

Study	Upper Extremity Positioning		
	Forearm Supination	Forearm Pronation	Neutral
Sarmiento and Latta, 2014[11]	*Radiography* Patients with displaced, extra-articular fractures with radial shortening >2 mm: 8% Patients with displaced, extra-articular fractures with change in dorsal angulation >2°: 0%	*Radiography* Patients with displaced, extra-articular fractures with radial shortening >2 mm: 39% Patients with displaced, extra-articular fractures with change in dorsal angulation >2°: 17%	
Wahlström, 1982[12]	*Radiography* Increase in dorsal angulation after reduction: 10.7° ± 8.6° Patients with change in dorsal angulation >10°: 50%†	*Radiography* Increase in dorsal angulation after reduction: 4.5° ± 5.2° Patients with redisplacement >10° dorsal angulation: 14.3%†	*Radiography* Increase in dorsal angulation after reduction: 9.6° ± 6.9° Patients with redisplacement >10° dorsal angulation: 50%
Sarmiento et al, 1975[15]	*Radiography* Patients that had change in volar tilt: 63.4% Patients that had change in radial deviation: 100% Patients that had change in radial length:56%		

* All values represent mean ± SD unless otherwise stated.
† Statistically significant.

wrist and forearm position are shown in Tables 4 and 5, respectively. No statistically significant differences were found in the rates of loss of reduction or recasting/refabricating an orthosis between the treatment groups based on the wrist or forearm position.

Table 4
Comparison of Percent Frequency of Complications and Outcomes by Wrist Position

Complications and Outcomes	Casting Position		*P* Value
	Wrist Extension, n	Wrist Flexion, n	
Loss of reduction	11.9 ± 4.7 (84)	16.3 ± 6.5 (326)	.64
Recast or orthosis	28 (50)*	31 ± 9.8 (97)*	-

* One study identified in this treatment group reported the above complication, so the SD cannot be calculated.

Discussion

This systematic review sought to investigate the available evidence for outcomes comparing various positions for immobilizing the upper extremity after a DRF. We found that the primary variables associated with positioning the upper extremity for the treatment of DRF are the wrist and forearm position. Only a limited meta-analysis, including rates of loss of reduction and recasting/refabricating an orthosis, was performed, as there was substantial variability in the data that were reported in the studies. Accordingly, this systematic review provides a qualitative and quantitative evaluation of the effects of wrist and forearm positioning in the conservative treatment of DRFs in order to provide improved treatment for future patients.

Results from the qualitative analysis of studies suggest that immobilization of DRFs with the wrist in extension produces better radiographic and functional outcomes. While the included studies found varying outcomes between the wrist flexion and extension groups, certain results suggest there are clinically significant benefits to immobilizing DRFs in wrist extension. For instance, the limited wrist extension exhibited by those treated in wrist flexion by Grle et al[8] would likely limit the ability of those patients to perform many activities of daily living.[17] Patients immobilized in dorsiflexion also scored an average of 3.84 points higher on the SF-12 physical component, which has been suggested to have a minimal important difference as low as 1 for certain wrist pathologies.[8,18] However, while many of the studies report differences in radiographic outcomes between the different positions, the clinical significance of these results is unclear.[19]

To explain the improved results in patients immobilized in extension, Grle et al[8] proposed that when the wrist is placed in extension, the radiotriquetral and radiocapitate ligaments better stabilize the joint due to their attachment with the distal row of carpal bones. Contrarily, when the wrist is in flexion, those ligaments lack the tension necessary to stabilize the distal radius.[8] Gupta[9] further suggests that the relatively greater strength of the radial extensors compared to the radial flexors also plays a role in fracture maintenance. By immobilizing the wrist in extension, the wrist extensors are placed at a mechanical disadvantage, which balances the displacing forces on the wrist.[9,20,21]

Currently, there is insufficient evidence to recommend a particular forearm position for DRF immobilization. The 2 studies that did assess the effects of forearm rotation on outcomes after immobilization of DRFs came to contradictory conclusions. Sarmiento and Latta[11] suggest that the contraction of the brachioradialis is a primary factor contributing to a loss of fracture reduction because of its displacing force on the distal radius. In a separate, electromyographic study, Sarmiento[22] found that forearm supination results in significantly less brachioradialis activity than pronation, which may explain the better results they attained by casting DRFs in supination.[11] However, Wahlström[12] observed the opposite to be true. They explain their findings by suggesting that the pronator quadratus could be the primary cause of DRF redisplacement. When the forearm is immobilized in supination, the pronator quadratus is contracted to a greater degree, potentially increasing the incidence of loss of reduction.[12]

There are some significant differences between the Wahlström[12] and Sarmiento studies[15,22] that limit direct comparisons between their analyses. Wahlström[12] only looked at women over the age of 40 that had extra-articular, displaced fractures and who were then immobilized with a dorsal plaster slab. Sarmiento and Latta,[11] contrarily, studied both men and women who sustained intra-articular or extra-articular fractures with or without displacement. These patients were immobilized in an above-elbow cast, followed by a functional cast that permitted mild elbow and

Table 5
Comparison of Percent Frequency of Complications and Outcomes by Forearm Position

Complications and Outcomes	Casting Position			*P* Value
	Forearm Neutral, n	Forearm Pronation, n	Forearm Supination, n	
Loss of reduction	21 ± 8.6 (181)	9 ± 1.9 (92)	10 ± 10.8 (137)	.60
Recast or orthosis	34 ± 8.5 (42)	7 (14)*	18 (92)*	-

* One study identified in this treatment group reported the above complication, so the SD cannot be calculated.

wrist motion. Though Sarmiento and Latta[11] divided portions of their results by the type of fracture and displacement, they did not test these results for statistical significance.

An important strength of this systematic review is the level of evidence of the included studies. Of the 8 included studies, 6 were RCTs. These trials had medium to large sample sizes (n = 42−156), further reducing potential confounding variables and strengthening the recommendations that can be made based on these studies. The 2 studies that were not RCTs were prospective, single-cohort studies that did not use a control or comparator group.[13,15]

Given the overall low to medium risk of bias, the reasonable sample sizes, and the high rates of follow up (>80%), the RCTs included in this systematic review were designated as having a level of evidence of 1b according to the Oxford Centre for Evidence Based Medicine criteria.[23] Two studies notably limited the patient demographics included in their RCTs, which narrows the generalizability of their findings and recommendations. As mentioned above, Wahlström's[12] study only included patients that were women over the age of 40. Raittio et al[14] only included patients over the age of 65.

The studies by Sarmiento et al[15] and Baruah et al[13] were both given a level of evidence designation of 2c using the Oxford Centre for Evidence Based Medicine criteria.[23] Because both studies used single-cohort designs, only indirect comparisons are able to be made to other treatment positions. This increases the possibility that confounding variables distort the relationship between the effectiveness of different positions of immobilization.

A limitation of this review is the heterogeneity of the literature on the position of immobilization for DRFs, which limits comparisons across studies. This lack of uniformity significantly limited the ability to perform meta-analyses and further stratify the groups for the calculations performed in Tables 4 and 5. For instance, the studies used a wide range of classification systems to determine inclusion criteria and treatment outcomes. Two studies used the AO classification system,[8,10] 1 used the Fernandez system,[13] 1 used the Frykman system,[15] 1 used the Lidström system,[12] and 2 used independent systems.[9,11] Of the 8 studies, 4 did not report any summary statistics (eg, mean and SD measurements for radial length and dorsal angulation) on radiographs taken prior to treatment,[10,11,13,15] and only 1 study reported radiographic data both before and after closed reduction of the fraction.[14] Only 4 of the 8 studies in this review included radiographic summary statistics taken after treatment.[8,12,14,15] Further, even though 5 of the 8 studies included multiple types of DRFs (eg, intra-articular and extra-articular), only 2 consistently reported radiographic results by fracture type.[9,11] None of the studies reported raw complication data with information on the age or sex of the patients in question, though 1 did perform a linear regression to determine the effects of age and sex on patient-rated wrist evaluation scores.[14]

Due to the impact of DRFs on the population, as well as the many complications that can arise from these fractures, it is important to understand the best method of treatment. Our systematic review of 8 studies with 16 treatment groups demonstrated that immobilization of the wrist in extension led to better range of motion, radiographic results, grip strength, and patient-reported functional outcomes, as well as decreased pain. Given the demonstrated clinical significance of limited range of motion and the SF-12, we believe there is a reasonable basis for preferentially immobilizing DRFs in wrist extension. However, this recommendation is only a weak one, as not only was there methodological variability between the studies included in this review, but there is also variability in the immobilization constructs used in clinical practice (eg, sugar tong orthoses, below-elbow casts, dorsal plaster orthoses), which likely affects patient outcomes. The results from the comparison of forearm immobilization in pronation versus supination were indeterminate, as 1 study indicates lower rates of loss of reduction in patients immobilized in supination, while the other found better results in patients immobilized in pronation.

However, this systematic review has also demonstrated the lack of uniform data to support an optimal positioning for conservative, nonsurgical management of DRFs. A more systematic approach to research involving positions of immobilization of DRFs is needed. To allow for better comparisons of future data on the conservative treatment of DRFs, we recommend researchers provide comprehensive data, including dividing the patients by fracture type with a universal classification system, providing statistics on radiographs taken before and after treatment, and conducting outcomes analyses controlling for age, sex, and fracture type.

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