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Review Article

META ANALYSIS STUDIES OF CLINICAL OBSERVATION OF INTERNAL FIXATION OF DISTAL RADIUS FRACTURES THROUGH DIFFERENT APPROACHES: DORSAL APPROACH VERSUS VOLAR APPROACH

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ABSTRACT

Fractures of distal radius account for up to 20% of all fractures dealt with in the emergency department. The initial valuation includes a history of the structure of injury, correlated injury and appropriate radiological evaluation. Medication options propose traditional management for internal fixation, external fixation, dorsal or volar plating with/without arthroscopy facilitation. A lot of questions regarding these fractures remain unsolved and good prospective randomized trials are required.

Objective: Meta-analysis studies of clinical observation of internal fixation of distal radius fractures through different approaches: Dorsal approach versus volar approach. The differences between the dorsal approach and the volar approach were also noted.

Methods: The meta-analysis followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines. Electrical databases (PubMed, EMBASE and the Cochrane library) were reclaimed to find RCTs and CSs sufficed the eligibility criteria. Data search, extraction, analysis, and quality evaluation were implemented based on the Cochrane Collaboration guidelines. Clinical outcomes were evaluated using various outcome measures.

Results: Clinical studies were incorporated in the analysis. An electronic databases were studied to understand the different approaches (volar and dorsal) of internal fixation of radius fracture. All the collected datas were converted into respective tables and presented in the article. No meaningful clinical differences were found between the techniques in clinical hand scoring, grip strength, and range of motion. Nevertheless, patient satisfaction after surgery was significant. It is difficult to judge the which approach is better for internal fixation of radial fracture. The possible complications and treatment were also noted in this study.

Conclusion: There is no approved plate fixation technique based on these study conclusions. In our opinion, the judgment for the type of plate fixation should be based on fracture type and surgeon's experience with the particular approach and plate types.

Keywords: Radius fractures, Fracture fixation, Volar Approach, Dorsal Approach, Patient Rated Wrist Evaluation,

INTRODUCTION

Fractures of the distal radius are the several frequent fractures of the upper extremity. Unlike the more common, lower-energy, extraarticular fractures, intraarticular distal radius fractures render a complex injury that is correlated with significant morbidity. Generally, the prognosis is less affirmative for displaced, comminuted, intraarticular fractures. The primary purpose behind these less affirmative outcomes is attributed to problems restoring and maintaining an anatomic reduction of the articular surface[5].

Distal radius fractures are an example of the most frequent injuries encountered in orthopedic practice. They make up 8%–15% of all bony injuries in adults[1][2]. In the last two decades, open reduction and internal fixation with dorsal or volar plates have obtained widespread reputation[3]. It is now the most commonly practiced surgical technique for displaced distal radius fractures in young active patients[4]. Distal radius fractures are principally associated with osteoporosis in elderly patients, and several studies reported satisfactory recovery after conservative treatment. However, unlike elderly patients, young patients who have normal bone quality suffer comminuted fractures or seriously displaced fractures as a result of high-energy trauma. Therefore, surgical treatment of distal radius fractures is commonly needed in young patients[6][7]. The decision between volar and dorsal plate fixation of the acute distal radius fracture is based on the area of fragment displacement and the surgeon's experience and preference[8][9]. An influential advantage of dorsal plating in dorsal displacement is direct visualization of the fracture fragments. Furthermore, the plate accommodates a buttress against dorsal collapse.

Volar plate fixation was originally maintained for volar displaced fractures, but it has become the standard strategy for dorsally displaced fractures in clinical practice[13]. Close contact between the volar plate and flexor tendons is evaded because of the long distance between flexor tendons and the volar cortex, and the pronator quadratus muscle covers the plate. In addition, the dorsal collapse of distal fragments can be prevented by inserting distal locking screws in the volar plate[14].

Open-reduction and internal-fixation techniques have been expanded to address the comminuted intraarticular distal radius fracture that cannot be anatomically diminished and maintained through external manipulation and ligamentotaxis[10][11][12].

Anatomy:

Exhibition of the distal radius and its fracture fragments is compounded by the close proximity of surrounding muscle, ligaments, tendons, and neurovascular structures. The individual alignment of numerous articular fracture fragments of the distal radius is influenced by these soft-tissue attachments[26]. When studying the distal radius, it is helpful to analyze its five “surfaces”: (1) the volar surface, (2) the radial surface,

(3) the dorsal surface, (4) the distal radiocarpal articular surface, and (5) the distal radioulnar articular surface. Knowing the anatomy and position of each facade is important for adequate exposure and subsequent decline in the management of distal radius fractures.

Volar Approach:

The volar approach to the distal radius can be utilized for both the volar plates and fragment specific fixation[27]. Volar plate application affords the advantage of placing the plate on the tensile side of the radius while also utilizing greater soft tissue coverage to minimize hardware prominence and irritation[28]. The volar approach can be achieved through three different intervals: (1) the Henry approach, (2) the trans-FCR approach, and the (3) volar-extensile approach. Both the Henry and trans-FCR approaches contribute excellent vulnerability to the volar surface of the distal radius for the reduction and internal fixation of distal radius fractures[29]. In contrast, the volar-extensile approach consolidates a carpal tunnel release and furnishes direct visualization and fracture reduction of the volar–ulnar corner of the distal radius, maximum volar visualization of the distal radioulnar joint, and extended exposure of the radiocarpal and mid-carpal joint[27]. Perfunctory landmarks should be noted and include the radial artery pulse, flexor carpi radialis tendon, and the ulnar artery pulse. In patients with greater girth, the flexor carpi radialis may be challenging to identify and can be located over the distal pole of the scaphoid at the wrist crease.

Dorsal Approach:

The dorsal approach to the distal radius can be adopted for the dorsal plate and fragment-specific fixation of fractures[30]. Accosting the distal radius along with its dorsal surface demands identification and navigation between the dorsal compartments of the wrist. The dorsal margin of the distal radius elongates further distally than the volar surface, emerging in the volar tilt that is observed on sagittal radiographs. Various intervals may be utilized between the various dorsal extensor compartments to approach the distal radius dorsally[31]. Two will be highlighted for their versatility and commonality. The trans-EPL approach also assigned to as the "universal dorsal approach," provides extensile vulnerability too much of the dorsal aspect of the distal radius. The dorsal–ulnar approach grants direct visualization of the dorsal–ulnar corner of the distal radius as well as the distal radioulnar joint.

MATERIALS AND METHODS

The systematic evaluation was performed following the Preferred Reporting Items for Systematic Reviews and MetaAnalyses (PRISMA) statement[15].

Data and literature sources:

Our systematic review was conveyed and reported in accordance with PRISMA guidelines. This study is a retrospective cohort study comparing dorsal with volar plate fixation in adult patients with intense distal radius fractures. Many comprehensive databases, including MEDLINE, EMBASE, WOS, SCOPUS, the Cochrane Library, etc were searched for studies. To distinguish other relevant studies, we also reviewed the references from the identified trials and comprehensive articles. Only those with full text accessible were acknowledged. After the original electronic search, pertinent articles and their bibliographies were searched manually.

Inclusion and Exclusion Criteria:

From the title and abstract, reviewers independently selected the relevant studies for the full review. The full-text copy of the article was reconsidered if the abstract did not contribute enough data to make a decision.Adult patients, who were operated with dorsal or volar plate fixation were chosen in this study. Implications for operative treatment were unsteady distal radius fractures. Definitions for weaving distal radius fractures were: loss of angulation > 15 degrees, radial shortening of at least 5 mm, comminution, intra-articular gap > 2 mm, and loss of reduction > 15 degrees after restricted reduction and during follow-up[16]. Few classifications of distal radius fracture are given in the tables below:

Table 1: Frykman classification of distal radius fractures

Fractures	Distal ulna fracture present	Distal ulna fracture absent
Extra-articular	I	II
Intra-articular		
*Radio-carpal joint involved	III	IV
*Radio-ulnar joint involved	V	VI
*Radio-carpal+radio-ulnar joint involved	VII	VIII

Table 2: Melone's classification of intra-articular distal radius fractures

Fracture	Description
Type I	Four components (radial shaft, radial styloid, dorsal medial and volar medial fragment) are undisplaced or show variable displacement of the medial complex as a unit. Such fractures show minimal comminution and are stable after closed reduction
Type II	There is significant displacement of the medial complex as a unit with a comminution of radial metaphysis and instability (die punch fracture)
Type III	Displacement and instability are similar to type II, with the spike fragment of the radial shaft component often projecting into the flexor compartment (spike fractures)
Type IV	There is severe disruption of the radial articular surface and the dorsal and volar medial fragments show wide separation or rotation. There are extensive soft tissue damage and nerve injury (split fractures)
Type V	Fracture results from a severe force comprising both compression and crush that cause extensive comminution, often extending from the articular surface to the diaphysis

Table 3: Fernandez classification of distal end of radius

Mechanism of injury	Fracture type
Bending	Metaphysis fails due to tensile stress (Colles' and Smith fracture)
Compression	Fracture of the surface of the joint with impaction of subchondral and metaphyseal bone (die punch fracture)
Shearing	Fracture of surface of the joint (Barton fracture and fracture of radial styloid process)
Avulsion	Fracture of ligamentous attachments (fracture of ulnar and radial styloid process)
Combination	Combination of (1) - (4) and high-velocity injury

Müller AO Classification of fractures:

The English language version of the system privileges consistent in detail description of a fracture in differentiated terminology by creating a 5-element alphanumeric code:

Localisation		Morphology		
Bone	Segment	Type	Group	Subgroup
1/2/3/4	1/2/3/(4)	A/B/C	1/2/3	.1/.2/.3

Localisation:

Primary, every fracture is given to 2 numbers to specify which bone it affects, and wherein the bone:

	1	2	3	4
Bone	Humerus	Radius and Ulna	Femur	Tibia and fibula
Segment	Proximal segment	Diaphyseal segment	Distal segment	*Malleolar segment (only used with tibia and fibula*

Type:

Specific fracture is alongside given a letter (A, B or C) to define the joint involvement of the fracture:

Segment	A	B	C
1	Extra-articular	Partial articular	Complete articular
2	Simple	Wedge	Complex
3	Extra-articular	Partial articular	Complete articular

Data collection covered functional consequence measures—specifically the Disabilities of the Arm, Shoulder, and Hand (DASH) and Patient Rated Wrist Evaluation (PRWE) questionnaires, which are the best accessible patient-reported outcome measurement instruments for distal radius fractures and have been recommended for functional outcome measurement[17]. Studies were covered in the meta-analysis if they (1) appraised the nonunion rate, postoperative complications, overall utilitarian outcome, postoperative pain, grip strength, and range of wrist motion subsequent surgery in acute scaphoid fractures; (2) reported direct comparisons of surgical outcomes in intense scaphoid fractures through both the dorsal and volar percutaneous approaches. We also collected published data on grip strength, wrist ROM (flexion, extension, supination, pronation, ulnar deviation, radial deviation), complications, and radiographic outcomes. Under circumstances in which wrist ROM was blazoned exclusively as a portion of the contralateral (normal) wrist, we converted percentages to a degree measurement based on normal physiologic ROM (normal values used: 85° flexion, 80° extension, 85° supination, 80° pronation, 35° ulnar deviation, and 20° radial deviation)[18][19]. Means and standard deviations (SDs) were consolidated when reported; medians were applied in place of means when the latter was not reported because these contribute an agreeable alternate measurement for centrality[20].

Exclusion criteria were: bilateral fractures, prior fractures of the wrist at the ipsilateral or contralateral arm, other fractures at the ipsilateral arm (except for distal ulnar fractures), and fractures blended with the neurovascular injury. Patients who had local disorders (e.g., tumors, Paget disease) and motor function disorders (e.g., central motor disorder, myasthenia gravis) were also prohibited. The added exclusion criterion was a follow-up duration of fewer than 2 years.

Data synthesis and Analysis:

The principal outcomes of the meta-analysis were the symmetry of cases that developed nonunion, postoperative complications, the weighted mean difference (WMD) in grip strength, and range of wrist motion; nevertheless, the standardized mean difference (SMD) was applied for overall functional outcome and postoperative pain. For all associations, odds ratios (ORs) and 95% confidence intervals (CI) were estimated for binary outcomes, while WMD or SMD and 95% CI were calculated for consecutive outcomes. Grip strength measurements were circumscribed as a percentage of the amount for the untouched side in three studies and as kilograms in one study. When the percentage confronted with the unaffected side was implemented, data were standardized with equal weighting of the kilograms according to the outcome measures from a prior study[21][22]. The range of wrist motion measurements was delimited as a percentage of the value for the modest side in two studies and as degrees in four studies. By using the same method specified above, data were standardized by the equal weighting of the degrees. For the overall operative outcome measure, we coupled comparable scores from different functional outcome tools when these tools scored disability on a 100-point scale; the lower the score, the greater the disability. Using the same method, we combined analogous scores of postoperative pain as presented on a 100-point scale, where 0 betokens the absence of pain and 100 indicates the worst pain imaginable. When standard deviations (SDs) were not involved, we calculated the SDs from the confidence interval (CI) or P value[23]. Heterogeneity was defined by estimating the proportion of between-study inconsistencies due to genuine differences between studies, rather than differences due to accidental error or chance using the I2 statistic, with values of 25%, 50%, and 75% considered low, moderate, and high heterogeneity, respectively.

Functional Assessment:

Our secondary study outcomes were functional and radiographic outcome measurements. Subjective functional outcome was measured with the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire and the Patient-Rated Wrist/Hand Evaluation (PRWHE) questionnaire. The DASH questionnaire is a self-reporting questionnaire with 30 items. These items evaluate symptoms and physical function of the whole upper extremity. The final score ranges from 0 to 100 points, in which lower numbers indicate a lower level of disability.

The PRWHE is a 15-item self-reporting questionnaire with a focus on wrist pain and disability in daily activities. The PRWHE score ranges from 0 to 100, in which 0 means no disability and 100 the worst disability[24].

After completing the questionnaires, the patients were clinically examined by the same researcher. Both wrists were tested, in which values for the injured side were compared with those for the contralateral side. Wrist and forearm range of motion was measured with a computerized goniometer. Movements were performed according to the American Medical Association (AMA) guidelines[25]. Grip strength was measured with Jamar Hand dynamometer (Sammons Preston Rolyan, Bolingbrook, IL) and pinch strength was measured with a hand-held dynamometer (MircoFET 2, Biometrics, Hoggan Scientific, Salt Lake City, UT). For each measurement, the mean of three repetitions was recorded because of the highest test-retest reliability.

Radiographic Assessment:

Standard posteroanterior and oblique radiographs of both wrists were performed at the end of follow-up. The authors autonomously evaluated these radiographs. The uninjured side was applied as a template to appraise whether radiographic parameters of the injured side had the absolute values as before trauma. The following radiographic parameters were judged on the posteroanterior view: radial inclination, ulnar variance, and radial length. Palmar tilt was estimated on the lateral view. To determine fracture type, initial radiographs instantly after the trauma of the wounded wrist were evaluated. Fractures were categorized into three main fracture types according to the AO classification system. This conveys to a substantial level of interobserver reliability and intraobserver reproducibility [32].

RESULTS

Identification of studies:

The specifications on study identification, inclusion, and exclusion are summarized in Fig 1. An electronic search generated 924 studies in PubMed (MEDLINE), 1119 in EMBASE, 640 in WOS, 1120 in SCOPUS, and 32 in the Cochrane Library. Five supplementary publications were identified through hand-operated searching. Following removing 2015 duplicates, 1825 studies prevailed; of these, 1810 were eliminated based on reading the abstracts and full-text articles, and an additional 8 studies were excluded because they had unusable information, contained only one of the six parameters (i.e., nonunion rate, postoperative complications, overall functional outcome, postoperative pain, grip strength, or range of wrist motion), or made inapplicable group comparisons. This ultimately resulted in 7 studies that were incorporated in the meta-analysis [33-39].

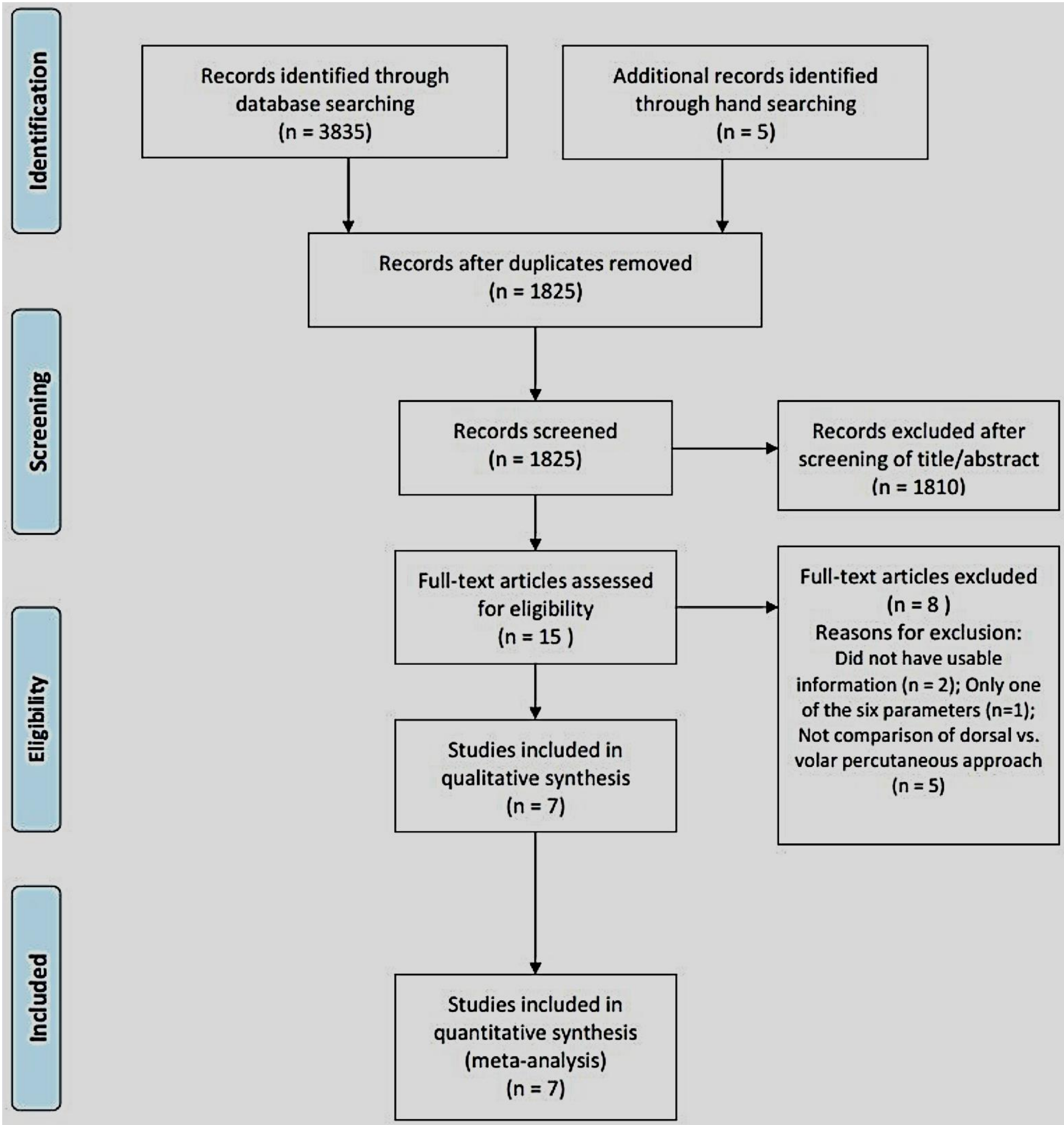

Figure 1: Fig 1. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow diagram of literature selection.

Study characteristics and patient populations:

The seven studies we analyzed included 141 patients who experienced surgical treatment through the dorsal percutaneous approach and 142 patients who underwent surgical treatment through the volar percutaneous approach. Two studies (1 RCT and 1 PCS) associated prospectively measured parameters, whereas the other five studies compared parameters measured by retrospective chart review. Six studies compared the nonunion rate and range of wrist motion, seven compared postoperative complications, two compared the postoperative pain scale, five compared the overall functional outcome, and four compared grip strength[Table1][40].

Study	Year	Study type	Sample size		Herbert type	Method of treatment	Follow-up (months)	Quality score	Measured parameters
			Dorsal	Volar					
Drac et al. [39]	2010	RCS	38	42	A2, B2	HC	At least 12	7	NUR, ROWM, GS, POC
Drac et al. [37]	2012	RCT	37	37	B2	HC	At least 12	5	NUR, OFO, ROWM, GS, POC
Gürbüz et al. [34]	2012	RCS	13	14	B1, B2, B3	HCVPCS	At least 37	7	NUR, OFO, ROWM, GS, POC
Jeon et al. [33]	2009	PCS	22	19	B2	HC	Mean 30	8	NUR, OFO, POP, ROWM, POC
Parajuli et al. [35]	2012	RCS	2	13	A2, B2, B3, C	HC	Mean 24	8	NUR, OFO, POC
Polsky et al. [38]	2002	RCS	16	10	B2	CDPCS	At least 14	7	NUR, POP, ROWM, GS, POC
Slade et al. [36]	2008	RCS	13	7	B2, B3	HVPS	Mean 18	7	OFO, ROWM, POC

Abbreviations: RCS, retrospective comparative study; RCT, randomized controlled trial; PCS, prospective comparative study; HC, Herbert screw; HCVPCS, headless cannulated variable pitch compression screw; CDPCS, cannulated differential pitch compression screw; HVPS, headless variable pitch screw; NUR, nonunion rate; OFO, overall functional outcome; POP, postoperative pain; ROWM, range of wrist motion; GS, grip strength; POC, postoperative complications

Table 1: Characteristics of the studies included in the meta-analysis.

Nonunion and postoperative complication rates:

Of the seven studies, six distinguished the nonunion rate in the dorsal and volar groups, which consisted of 128 and 134 patients, respectively. The symmetry of patients who emerged nonunion was similar between groups. All seven studies manifested data on the proportion of patients who developed postoperative complications, with no significant difference between groups. The results of sensibility analysis were not substantially differentiated compared with those of the fundamental analysis, including that the findings are muscular to the decisions made in the process of obtaining them (Fig 4A and 4B) [40].

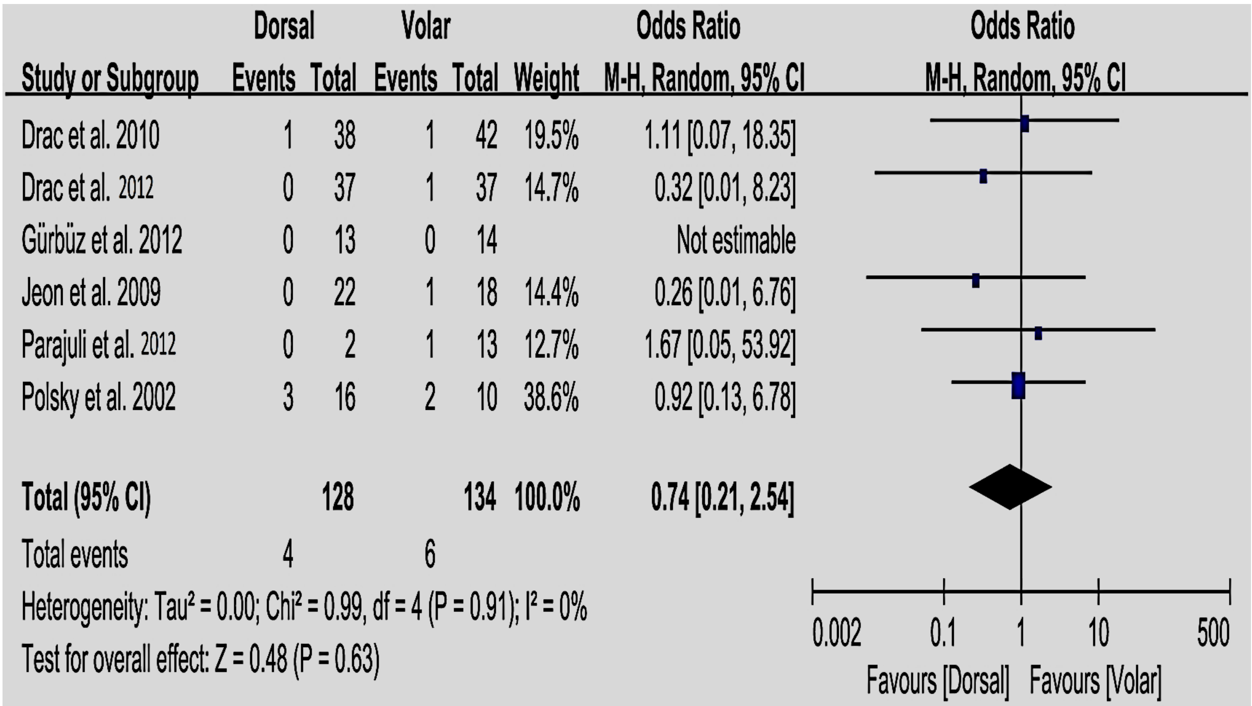

Figure 2: Results of aggregate analysis for comparison of nonunion rate (NUR) according to different approaches of radius distal fracture.

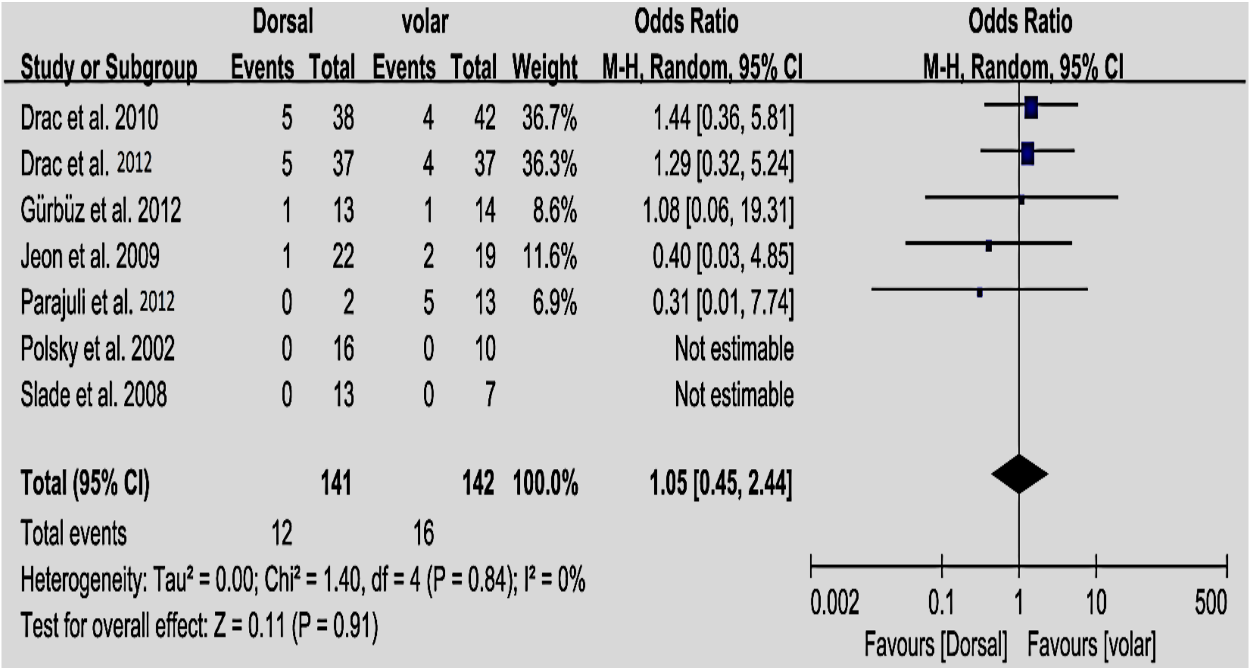

Figure 3: Results of aggregate analysis for comparison of postoperative complications (POC) according to different approaches of radius distal fracture.

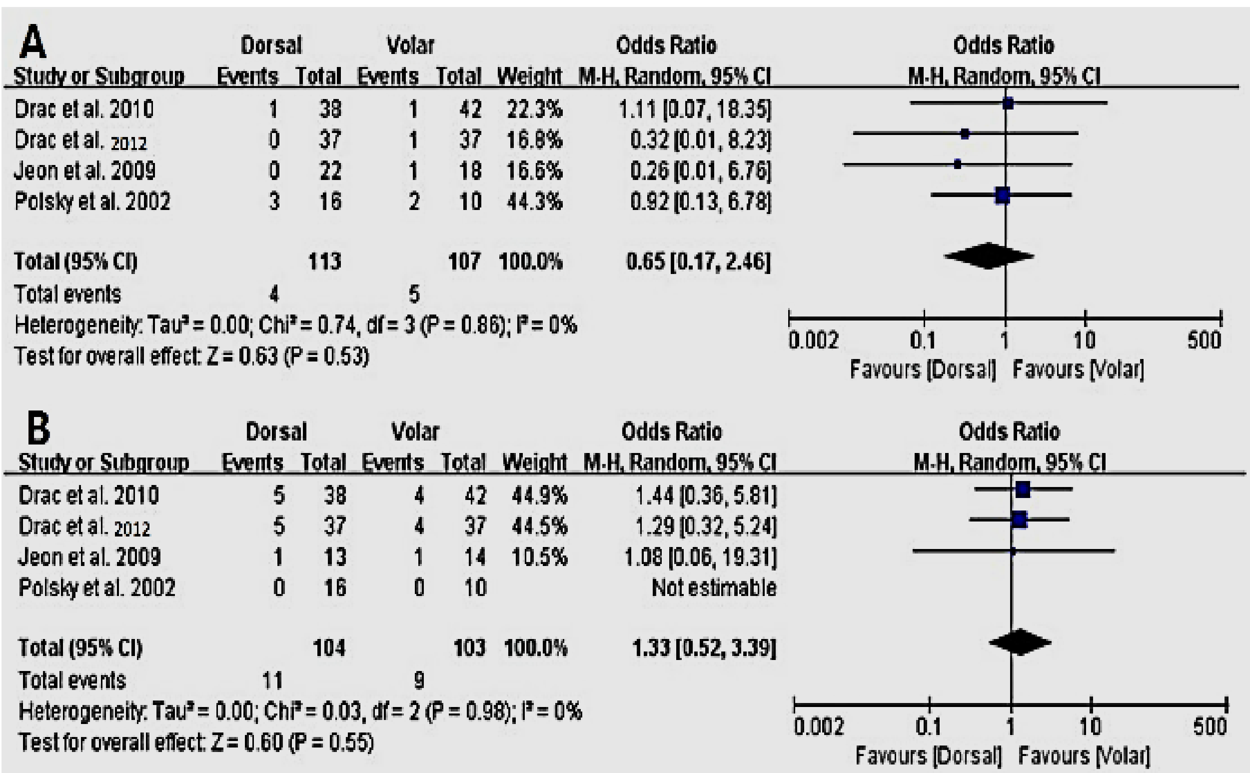

Figure 4: Sensitivity analysis.

Forest plots of: (A) nonunion rate (NUR) and (B) postoperative complications (POC) for studies of radius distal fracture.

Overall functional outcome, postoperative pain, and grip strength:

The overall operative outcome for the two approaches, comprising 91 patients treated with the dorsal approach and 89 treated with the volar approach. The standardized mean was 0.09 points more inferior in the dorsal group than the volar group, but this difference was not significant. Two studies, including 38 patients administered with the dorsal approach and 28 treated with the volar approach, informed the postoperative pain. Four studies compared grip strength among the two approaches, involving 104 patients treated with the dorsal approach and 103 treated with the volar approach[40].

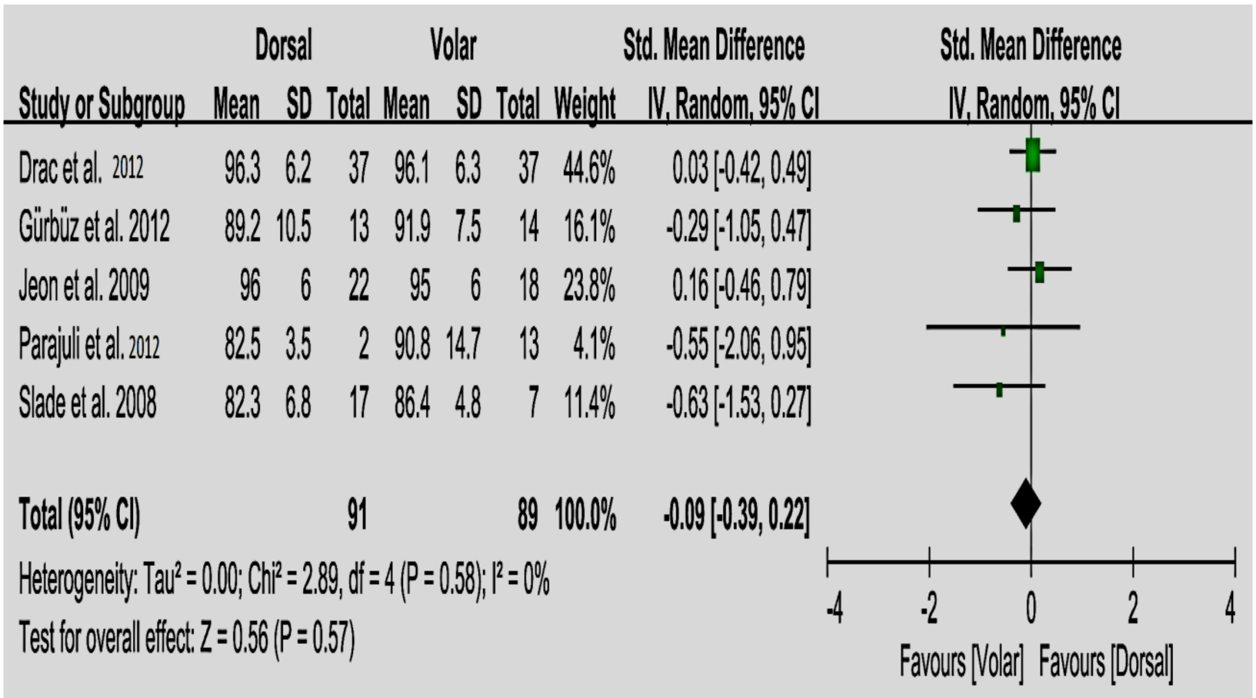

Figure 5: Results of aggregate analysis for comparison of overall functional outcome (OFO) according to different approaches of radius distal fracture.

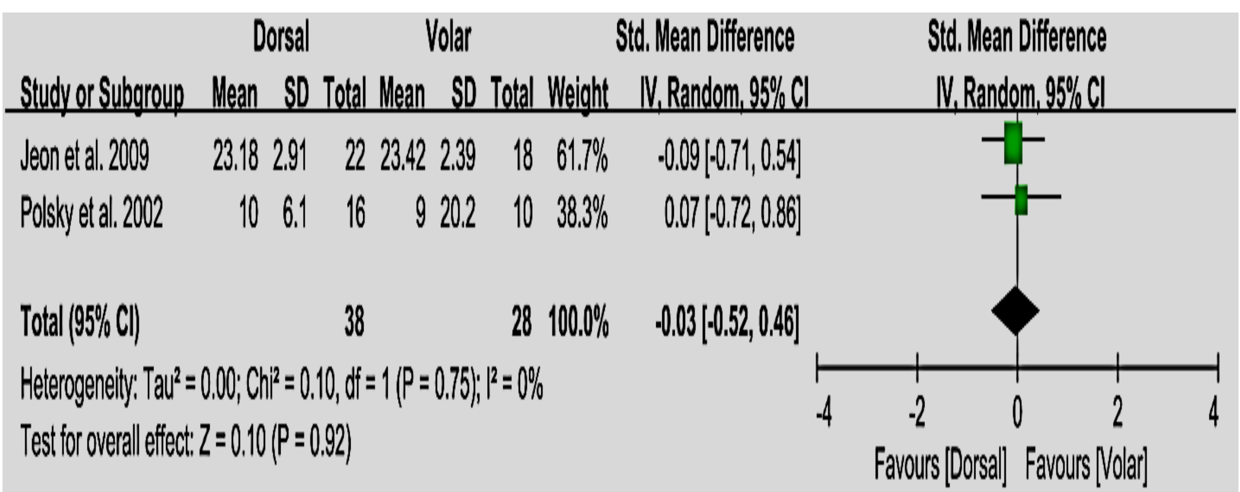

Figure 6: Results of aggregate analysis for comparison of postoperative pain (POP) according to different approaches of radius distal fracture.

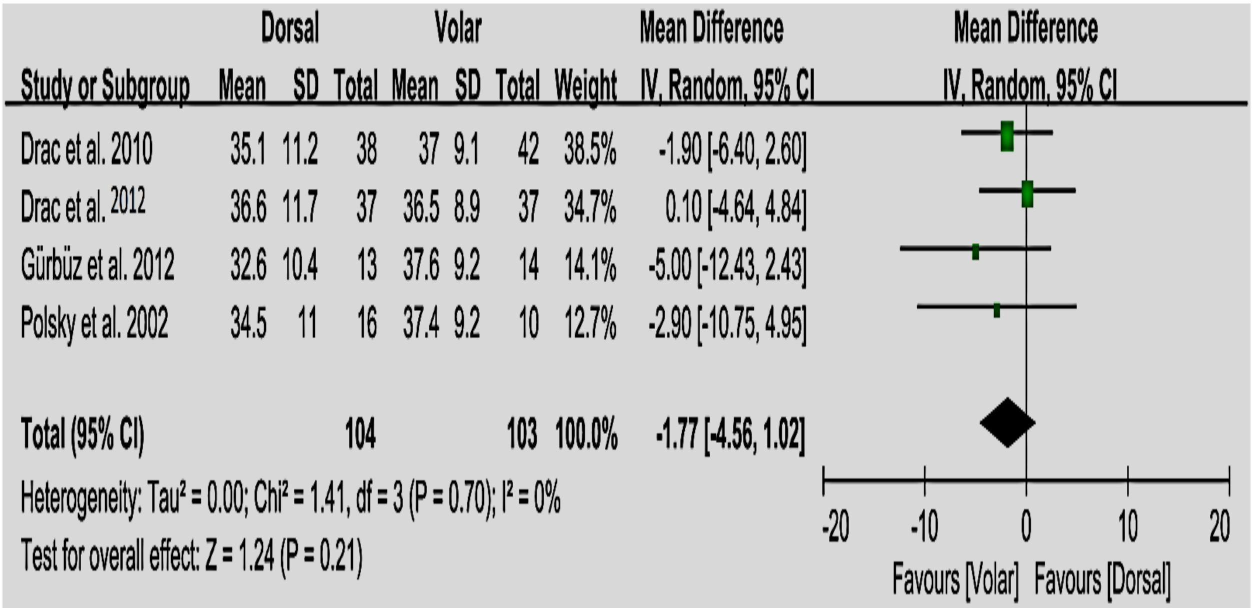

Figure 7: Results of aggregate analysis for comparison of grip strength (GS) according to different approaches of radius distal fracture.

Range of wrist motion (flexion, extension, radial deviation, and ulnar deviation):

Diverse studies are compiled in the given table below:

Study or Subgroup	Dorsal Mean	Dorsal SD	Dorsal Total	Volar Mean	Volar SD	Volar Total	Weight	Mean Difference IV, Random, 95% CI
1 Flexion								
Drac et al. 2010	61.4	10.5	38	60.1	8.7	42	5.5%	1.30 [-2.95, 5.55]
Drac et al. 2012	59.6	8.7	37	62.5	10.1	37	5.4%	-2.90 [-7.20, 1.40]
Gürbüz et al. 2012	62.1	10.6	13	58.2	8.4	14	2.4%	3.90 [-3.35, 11.15]
Jeon et al. 2009	66	4	22	67	6	18	7.5%	-1.00 [-4.24, 2.24]
Polsky et al. 2002	60.3	10.3	16	63.4	9.2	10	2.2%	-3.10 [-10.71, 4.51]
Slade et al. 2008	62.8	11.6	13	68.6	10.7	7	1.3%	-5.80 [-15.93, 4.33]
Subtotal (95% CI)			**139**			**128**	**24.4%**	**-0.86 [-2.86, 1.13]**
Heterogeneity: Tau² = 0.00; Chi² = 4.77, df = 5 (P = 0.44); I² = 0%								
Test for overall effect: Z = 0.85 (P = 0.40)								
2 Extension								
Drac et al. 2010	56.1	11.8	38	57.3	8	42	5.1%	-1.20 [-5.66, 3.26]
Drac et al. 2012	58.5	8	37	57	7.8	37	6.7%	1.50 [-2.10, 5.10]
Gürbüz et al. 2012	60.7	12.8	13	60.7	8.5	14	1.9%	0.00 [-8.26, 8.26]
Jeon et al. 2009	61	5	22	60	5	18	7.8%	1.00 [-2.11, 4.11]
Polsky et al. 2002	60.9	12.8	16	56.2	7.9	10	2.1%	4.70 [-3.26, 12.66]
Slade et al. 2008	60.8	14.7	13	63.6	7.5	7	1.4%	-2.80 [-12.53, 6.93]
Subtotal (95% CI)			**139**			**128**	**25.1%**	**0.75 [-1.17, 2.67]**
Heterogeneity: Tau² = 0.00; Chi² = 2.41, df = 5 (P = 0.79); I² = 0%								
Test for overall effect: Z = 0.76 (P = 0.44)								
3 Radial deviation								
Drac et al. 2010	30.6	10.7	38	27.7	10.7	42	4.8%	2.90 [-1.80, 7.60]
Drac et al. 2012	31	10.4	37	30.1	9.9	37	4.9%	0.90 [-3.73, 5.53]
Gürbüz et al. 2012	24.8	8.7	13	33.2	12.8	14	2.0%	-8.40 [-16.61, -0.19]
Jeon et al. 2009	25	2	22	24	1	18	14.3%	1.00 [0.05, 1.95]
Polsky et al. 2002	17.5	6.1	16	19.2	7.4	10	3.8%	-1.70 [-7.17, 3.77]
Subtotal (95% CI)			**126**			**121**	**29.7%**	**0.32 [-1.94, 2.58]**
Heterogeneity: Tau² = 2.54; Chi² = 6.54, df = 4 (P = 0.16); I² = 39%								
Test for overall effect: Z = 0.27 (P = 0.78)								
4 Ulnar deviation								
Drac et al. 2010	48.2	15.5	38	48.2	15.9	42	2.7%	0.00 [-6.89, 6.89]
Drac et al. 2012	47.5	12.4	37	50.5	15.1	37	3.1%	-3.00 [-9.30, 3.30]
Gürbüz et al. 2012	44.2	14.2	13	50.3	16.6	14	1.0%	-6.10 [-17.73, 5.53]
Jeon et al. 2009	32	3	22	34	2	18	12.5%	-2.00 [-3.56, -0.44]
Polsky et al. 2002	25.9	8.3	16	40.4	13.3	10	1.6%	-14.50 [-23.69, -5.31]
Subtotal (95% CI)			**126**			**121**	**20.9%**	**-3.71 [-7.48, 0.05]**
Heterogeneity: Tau² = 8.27; Chi² = 7.79, df = 4 (P = 0.10); I² = 49%								
Test for overall effect: Z = 1.93 (P = 0.05)								
Total (95% CI)			**530**			**498**	**100.0%**	**-0.58 [-1.81, 0.65]**
Heterogeneity: Tau² = 2.52; Chi² = 36.53, df = 21 (P = 0.02); I² = 43%								
Test for overall effect: Z = 0.93 (P = 0.35)								

Figure 8: Results of aggregate analysis for range of wrist motion (ROWM) according to different approaches of distal radius fracture, including subgroup analysis by flexion, extension, radial deviation, and ulnar deviation.

DISCUSSION

Throughout the years, an ongoing controversy exists whether volar or dorsal plating is the appropriate technique for internal fixation of distal radius fractures. Studies exhibited contradictory results concerning the complication rates. Our study explicated no significant differences in complication rates between the volar and dorsal approach.

The study suggests that the development of complications is principally caused by the different anatomical structures which are associated with dorsal or volar plate fixation[4]. The study by Ruch and Papadonikolakis published a statistically significant association of volar collapse of the distal scrap when the distal screws were pointing proximally in patients with dorsal plate fixation[41]. Through this lack of reduction, the plate grows more prominent in its relation to the overlying extensor tendons and may cause tendon problems. At present, only a few studies have been published in which a correlation is made between volar plates and low-profile dorsal plates for internal fixation of the distal radius. Most studies displayed a lower complication rate after dorsal plate fixation[42]. Various factors such as fracture type, type of plate, and the surgeon's experience are plausible causes for the contradictory results. In extension, different definitions of complications were practiced in several studies. Based on the heterogeneity of all studies, we debated that the surgical decision for the surgical approach should be based on fracture type and surgeon's experience with the specific approach and plate types.

The various important finding of this meta-analysis was that the dorsal and volar strategies for the surgical treatment of distal radius fracture did not drive to significant diversity in the non-union valuation, postoperative complexities, overall functional consequence, postoperative pain, grip strength, or range of wrist motion, including flexion, extension, or radial deviation. Nevertheless, the volar approach directed to significantly greater ulnar deviation than the dorsal approach.

Based on the consequences of the present study, it prevails unclear which technique is superior in terms of clinical outcomes and grip strength. Conventional techniques were popularly used for distal radius fractures. However, they often need meticulous soft tissue stripping such as pronator quadratus dissection and result in periosteal injury and may be associated with the dawdled union, nonunion, or high rates of postoperative infection[43].

Despite the theoretical evidence, comparative studies examining the two techniques revealed no meaningful differences and our meta-analysis also revealed no significance in the comparison of the two groups. This discrepancy might be associated with a small fraction of patients, different ages of the patients, and different follow-up times. Therefore, the decisions of the present study should be evaluated with great caution; the data were extracted from heterogeneous studies. In the future, to overwhelm the impact of these confounders, larger-scale randomized prospective studies that manage these independent factors need to be encouraged.

CONCLUSION

The refurbishment of upper-extremity function is the principal goal in the treatment of patients with intraarticular distal radius fractures. The medians to which this is accomplished depends on various patient-related factors—the "personality" of the fracture and the operative technique suggested. Open reduction and internal fixation are symbolized in the treatment of patients with unsteady distal radius fractures and those with articular incongruity afforded sufficient bone stock is present to authorize a stable construct and early range of motion. The critical early diagnosis and treatment of patients with these injuries are critical in preventing the negative sequelae associated with these fractures. Of equal significance is the recognition and treatment of patients with any associated ipsilateral soft-tissue or skeletal injuries. With the refinement of open-reduction techniques appropriating lower-profile implants and mechanic constructs created to support each column of the injured wrist, an earlier range of motion, and advanced functional results can be achieved. Unlike clinical results and postoperative grip strength, there was a significant difference in patient gratification between the groups, which may be correlated with the small skin incision and minimal soft tissue dissection. The conventional procedure entails a large longitudinal skin incision and wide dissection, which can cause tendon rupture, median nerve injury, cosmetic defects associated with a large scar, soft tissue adhesion, and longer operation time.

Despite its strengths, our study has several limitations. First, this meta-analysis mainly involved retrospective studies and only one randomized controlled experiment was included for each technique. This was because only a few prospective primary studies with a low opportunity of bias had been published previously. Second, the methodologies of the incorporated studies were somewhat diverse from each other, suggesting the presence of heterogeneity. Various determinants such as patients' characteristics, follow-up period, separate scoring systems for evaluation, and the type of plate need to be restrained, because these factors may influence the postoperative results. Third, the characteristics of distal radius fractures were not wholly acknowledged. The minimally invasive procedure in patients with distal radius fractures should be implemented with more strict indications.

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