ORIGINAL ARTICLE

Dorsoradial vs. circular cast for distal radius fractures: a retrospective comparative cohort study

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ABSTRACT

BACKGROUND: Non-articular dorsally angulated distal radius fractures (DRFs) are often managed conservatively, yet the optimal cast design remains debated. Dorsoradial (DR) casting leaves the ulnar border open, potentially better accommodating swelling and reducing early cast-related interventions.

METHODS: A single-center retrospective cohort study included adults with AO-23-A2/A3 DRFs treated between May 2019 and May 2023. Patients received either a DR cast (n=88) or a conventional circular cast (CC) (n=122) for a standard five-week immobilization. Primary outcomes included functional (Patient-Rated Wrist Evaluation, PRWE) and clinical (Gartland-Werley, GW) scores, along with radiographic alignment (volar tilt, radial inclination, radial height) at a median follow-up of 118.5 weeks. Secondary outcomes were early cast revisions (release or reinforcement) and complications. Statistical tests included Mann-Whitney U, χ^2/Fisher, with Bonferroni-adjusted α=0.017.

RESULTS: Baseline characteristics were similar across groups: mean age 60±11 years, 87% female, comparable AO subtype distribution, and osteoporosis status. Early revision: DR 22.7% vs. CC 36.1% (absolute risk reduction 13% points; odds ratio: 0.51, p=0.038), primarily due to fewer cast releases for swelling/pain (12.5% vs. 32.8%, p=0.001). Function: PRWE scores were 34±18 (DR) vs. 36±18 (CC), p=0.435; GW scores were good-excellent in 79.5% vs. 77.8%, p=0.508. Radiographic outcomes: final volar tilt and radial height were similar (both p>0.08). DR casts better preserved radial inclination (median change 0°, p=0.057) compared to CC casts, which lost 1.3° (-6%, p<0.001); however, the net 1.2° intergroup difference is below the 5° minimal clinically important difference (MCID) and is clinically negligible. No cases of compartment syndrome or acute carpal tunnel occurred.

CONCLUSION: Dorsoradial casting delivers functional and radiographic outcomes equivalent to circular casting while reducing early revision rates by one-fifth. By lowering unplanned cast adjustments and follow-up visits, the DR technique represents a pragmatic alternative for centers with limited monitoring capacity treating dorsally angulated extra-articular DRFs.

Keywords: Distal radius fracture; dorsoradial cast; circular cast; Patient-Rated Wrist Evaluation (PRWE); conservative treatment.

INTRODUCTION

Distal radius fractures (DRFs) are the most common fractures in adults, with the highest risk observed in individuals over the age of 65. Despite their high incidence, there is worldwide variability in treatment strategies for displaced fractures in adult patients. Displaced DRFs are typically reduced and immobilized with a splint or circular plaster cast. Unfortunately, 30-40% of DRFs are unstable after closed reduction, leading to fracture displacement during follow-up under plaster immobilization. Management of DRFs is performed either conservatively or surgically, depending on multiple factors such as fracture type, stability, patient age, and functional expectations.[1]

No clinically significant benefit of surgery over plaster immobilization has been demonstrated in terms of functional out-

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comes in elderly patients.[2]

Over the years, a wide variety of immobilization methods have been described for the treatment of DRF, including circular casts, dorsal splints, dorsomedial splints, dorsoradial splints, long-arm casts, and long-arm splints.[3] Whether a circular cast or a splint is used depends on the clinician's preference and habits. Due to its moldable structure, a circular cast provides more effective stability for fracture immobilization. However, although its stability appears lower, beginning treatment with a splint and switching to a circular cast at the first follow-up is recommended, as the splint carries a lower risk of pain and compartment syndrome due to post-reduction swelling.[4]

The immobilization method in the volar flexion and ulnar deviation (VFUD) position was first described in 1910. This position is still recommended for dorsally angulated fractures, as it is thought to preserve fracture alignment through ligamentotaxis. Although this positioning is generally accepted, there is insufficient high-quality evidence to determine the optimal method.[5] Previous studies have compared different approaches, such as dorsal splints versus circular casts, during the early phase of conservative treatment and have generally found similar radiological outcomes and complication rates. However, many of these studies, including those focused on early-phase immobilization, have been limited to short-term assessments and do not provide insight into treatment outcomes over the entire immobilization period.[6]

This research aimed to compare patients treated with either a circular cast or a dorsoradial cast throughout the entire course of conservative treatment for dorsally angulated, non-articular distal radius fractures, focusing on fracture displacement, cast or treatment modifications, complications, and functional and radiological outcomes. We hypothesized that dorsoradial casts would result in clinical outcomes comparable to those of circular casts while requiring fewer interventions.

MATERIALS AND METHODS

This comparative retrospective cohort study included patients diagnosed with acute distal radius fractures between May 2019 and May 2023 at the Orthopedics and Traumatology Clinic of a local trauma hospital, identified via the electronic Hospital Information Management System. Exclusion criteria were: patients with AO fracture types other than 23-A3 or 23-A2; those requiring immediate surgical intervention at the first assessment; patients with open fractures or multiple injuries; those who did not follow the same physical therapy program; those with insufficient follow-up data (<1 year); and those who declined participation in the final assessment. All procedures were conducted in accordance with the ethical standards of the Declaration of Helsinki. Ethics approval was granted by the local institutional ethics committee (Date: 02.03.2023, No: 84-84-14). Informed consent was obtained from all participants.

Patients were divided into two groups based on whether they received a circular or dorsoradial cast, and their age, sex, and comorbidities were recorded. All patients were treated with either a dorsoradial cast or a circular cast. The dorsoradial cast involved the application of a hard plaster cast to the dorsal, radial, and volar aspects of the wrist (extending from the first web space to the palm, bypassing the thumb), leaving the ulnar side free (Fig. 1). In contrast, the circular cast was applied by wrapping a hard plaster cast circumferentially around the wrist. Unlike splints, neither type of cast could be removed by the patient. Patients without at least a one-year follow-up radiograph were excluded from the study. Those with complete and accessible imaging were contacted and invited for follow-up examinations at the hospital. All patients followed the same physical therapy program. Patients who declined participation were evaluated during routine visits; however, their data were not included in the study results.

The Patient-Rated Wrist Evaluation (PRWE) questionnaire

Figure 1. Preparation and application of the dorsoradial cast. **(a)** 18-layer plaster cast; **(b,c)** application of cotton padding and plaster (volar and dorsal views); ßß cast applied in the volar flexion and ulnar deviation (VFUD) position (radial, volar, and dorsal views).

and the Gartland and Werley (GW) Clinical Scale were administered to each participant.[7] Range of motion and grip strength were evaluated using a goniometer and dynamometer, respectively, by comparing the affected side with the healthy side. Fracture type and post-reduction acceptability were determined based on initial X-rays available in the system. Cast duration and any casting or treatment modifications were extracted from patient records. Volar tilt, radial inclination, ulnar height, and the degree of arthrosis (according to the Knirk and Jupiter classification) were evaluated on the final follow-up radiological images. These findings were also incorporated into the GW score. All radiographic measurements were performed by a single observer; therefore, inter-observer reliability (ICC) could not be calculated.

Casting and/or treatment revisions identified from the collected data were categorized. Some of these revisions involved cast reinforcement. In cases where the cast had softened or loosened due to decreased swelling, the existing cast was not removed. Instead, in the circular cast group, additional material was applied over the original cast, while in the dorsoradial cast group, support was provided with a bandage. Other revisions involved cast release. Patients who reported excessive pain or exhibited more swelling than expected in the fingers underwent unilateral cast release within the first seven days. In the circular cast group, release was performed on the ulnar side using a cast saw: in the dorsoradial cast group, the ulnar-side bandage was cut with scissors. In both methods, the underlying cotton padding was left intact. Following this intervention, immediate control X-rays were obtained. If these X-rays showed a loss of reduction, an attempt was made to restore the reduction. For patients whose control X-ray measurements remained within acceptable limits, treatment continued without further intervention. Patients who could not maintain their reduction were offered the option of surgery. Those who agreed underwent the procedure, while those who declined continued to be monitored with the same cast. Despite any treatment adjustments, all patients were included in the final analysis to ensure a thorough assessment of outcomes.

The statistical analysis was conducted using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY). Descriptive statistics were presented as frequencies and percentages for categorical variables, and as mean, median, range (minimum–maximum), and standard deviation for continuous variables. For comparisons between groups, the Independent Sample t-test was used for continuous variables, and the Pearson Chi-Square Test or Fisher's Exact Test was used for categorical variables. Additionally, non-parametric tests such as the Mann-Whitney U Test (for independent groups) and the Wilcoxon Signed Rank Test (for within-group comparisons) were used for data that did not meet the assumptions for parametric testing. A p-value below 0.05 was considered indicative of statistical significance.

Based on the published minimum clinically important difference (MCID) of 11.5 points for the PRWE in distal radius fractures, [8] and an assumed pooled standard deviation of 18 points, the effect size was set at d=0.61. An a priori power analysis performed using G*Power 3.1 (one-tailed independent-samples t-test, α=0.05, power=0.95, allocation ratio 1:1) indicated that 59 patients per group (total=118) would be required to detect the MCID with 95% power.

RESULTS

Patient Enrollment and Allocation

A total of 403 patients were assessed for eligibility. Following exclusions based on predefined criteria, 355 patients were allocated into two groups: 141 in the dorsoradial cast group and 214 in the circular cast group. Further exclusions during follow-up (due to open fractures or multiple injuries, insufficient follow-up data, not following the same physical therapy program, or refusal to participate in the final assessment) resulted in the inclusion of 88 patients in the dorsoradial cast group and 122 in the circular cast group for final analysis. A flowchart illustrating the patient selection process was created in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology)[9] cohort reporting guidelines (Fig. 2). A comparison between analyzed patients (n=210) and those lost to follow-up (n=193) showed no significant differences in age, sex, AO subtype, or baseline radiographic parameters (all p>0.05). To minimize selection bias, we performed 1:1 propensity score matching based on age, sex, AO subtype, osteoporosis status. The early revision advantage for dorsoradial casts remained significant (odds ratio [OR]=0.31, 95% confidence interval [CI]: 0.14–0.68, p=0.003).

Baseline Characteristics

Patients' ages ranged from 36 to 84 years, with a mean of 60.4±11.1 years. The follow-up duration ranged from 86 to 162 weeks, with a mean of 122.1±24.3 weeks. The majority of patients were female (87.1%, n=183). Most fractures were classified as AO type 23-A2 (85.2%, n=179), with the remain-

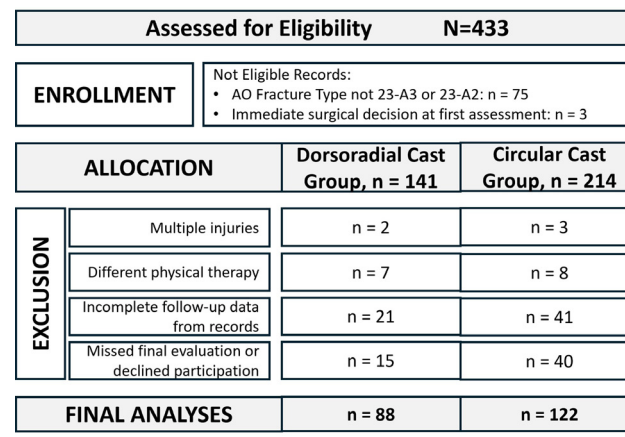

Figure 2. Flow chart.

Table 1. Demographic and clinical characteristics of all patients

Variable (N=210)	N (%)	Mean±SD (Min-Max)	Median
Age	60.4±11.1	62 (36-84)	
Follow-up Duration (Weeks)		122.1±24.4	118.5 (86-162)
Sex			
Male	27 (12.9)		
Female	183 (87.1)		
AO Fracture Type			
23-A2	179 (85.2)		
23-A3	31 (14.8)		
Comorbidities			
None	139 (66.2)		
One Systemic Disease	25 (11.9)		
Two Systemic Diseases	28 (13.3)		
>2 Systemic Diseases	18 (8.6)		
Osteoporosis Diagnosis	48 (22.9)		
Before Reduction			
Volar Tilt (°)		-16.07±10.73	-15 (-34-10)
Radial Inclination (°)		10.24±3.25	10 (5-15)
Radial Height (mm)		1.66±5.02	1 (-6-11)
After Reduction			
Volar Tilt (°)		18.59±5.93	19 (6-35)
Radial Inclination (°)		26.02±4.07	27 (18-33)
Radial Height (mm)		13.65±3.83	14 (7-20)
Cast Revisions			
No Modification	146 (69.5)		
Cast Augmentation	13 (6.2)		
CR and the treatment continued as is	14 (6.7)		
CR+RR and the treatment continued as is	17 (8.1)		
CR+RR and surgery were recommended but declined	3 (1.4)		
CR+RR and surgery performed	17 (8.1)		
Last Follow-up			
Volar Tilt (°)		15.95±6.11	17 (4-27)
Radial Inclination (°)		25.77±3.88	26 (13-33)
Radial Height (mm)		13.20±4.45	13 (5-21)
Knirk-Jupiter Degree			
No evidence of arthrosis	123 (58.6)		
Mild joint space narrowing	55 (26.2)		
Significant joint space narrowing	25 (11.9)		
Bone-on-bone, osteophyte/cyst formation	7 (3.3)		
PRWE Scores			
Pain Score (0-50)		15.7±10.3	14.5 (0-45)
Specific Functions		26.9±13.4	26 (0-57)
Daily Functions		11.3±8.2	10 (0-39)
Total Functional Score		19.1±10.1	18.8 (2-48)
Total Score (0-100)		34.8±18.2	33.8 (3-90)
Gartland-Werley Score			
0-2 points (Excellent)	33 (15.7)		
3-8 points (Good)	132 (62.9)		
9-20 points (Fair)	37 (17.6)		
>20 points (Poor)	8 (3.8)		

RR: Reduction Renewed; CR: Cast Released; PRWE: Patient-Rated Wrist Evaluation.

Table 2. Demographic and clinical characteristics by casting method

Variable (N=210)	Dorsoradial Cast (n=88) N (%) or Median (Min-Max)	Circular Cast (n=122) N (%) or Medi-an (Min-Max)	P-value
Age	55 (42-80)	63 (36-84)	0.582[a]
Sex			
Male	9 (10.2)	18 (14.8)	0.448[b]
Female	79 (89.8)	104 (85.2)	
AO Fracture Type			
23-A2	77 (87.5)	102 (83.6)	0.433[b]
23-A3	11 (12.5)	20 (16.4)	
Comorbidities			
None	63 (71.6)	76 (62.3)	0.225[b]
One Systemic Disease	7 (8)	18 (14.8)	
Two Systemic Diseases	13 (14.8)	15 (12.3)	
>2 Systemic Diseases	5 (5.7)	13 (10.7)	
Osteoporosis Diagnosis	21 (23.9)	27 (22.1)	0.898[b]
Any Cast Revision			
Cast Release	11 (12.5)	40 (32.8)	0.001[b]
Cast Reinforcement	9 (10.2)	4 (3.3)	0.039[b]
Cast Release Details			
CR and the treatment continued as is	4 (4.5)	10 (8.2)	0.295[b]
CR+RR and the treatment continued as is	5 (5.7)	12 (9.8)	0.276[b]
CR+RR and surgery recommended but refused	0 (0.0)	3 (2.5)	0.266[c]
CR+RR and surgery performed	2 (2.3)	15 (12.3)	0.009[c]
Follow-up Duration (weeks)	120 (88-162)	117 (86-162)	0.946[a]
Knirk-Jupiter Degree			
No arthrosis	61 (69.3)	72 (59.0)	0.197[d]
Mild joint space narrowing	20 (22.7)	28 (23.0)	
Significant joint space narrowing	6 (6.8)	20 (16.4)	
Bone-on-bone, osteophyte/cyst formation	1 (1.1)	2 (1.6)	
PRWE Scores			
Pain Score (0-50)	14 (0-45)	15 (0-44)	0.749[a]
Specific Functions	26.5 (3-55)	26 (0-57)	0.302[a]
Daily Functions	10 (0-36)	9 (0-39)	0.346[a]
Total Functional Score	20.5 (2-45)	17.5 (3-48)	0.199[a]
Total Score (0-100)	33.3 (4-90)	34 (3-86.5)	0.435[a]
Gartland-Werley Score			
0-2 points (Excellent)	11 (12.5)	22 (18.0)	0.508[d]
3-8 points (Good)	59 (67.0)	73 (59.8)	
9-20 points (Fair)	16 (18.2)	21 (17.2)	
>20 points (Poor)	2 (2.3)	6 (4.9)	

[a]Mann-Whitney U Test. [b]Chi-Square Test. [c]Fisher's Exact Test. [d]Chi-Square with Monte Carlo simulation. RR: Re-Reduction Performed; CR: Cast Released; PRWE: Patient-Rated Wrist Evaluation.

ing classified as type 23-A3 (14.8%, n=31). Regarding comorbidities, 66.2% (n=139) of patients had no systemic disease, while 22.9% (n=48) had a diagnosis of osteoporosis (Table 1).

The distribution of demographic and clinical characteristics according to the fixation methods is presented in Table 2. There were no significant differences between the two groups in terms of age, sex, AO fracture type, comorbidities, or osteoporosis diagnosis. All patients underwent casting for a fixed period of 5 weeks. This protocol was applied at our center for two reasons: (i) reimbursement regulations

preclude routine computed tomography (CT) evaluation at 3 weeks, and (ii) many elderly patients are unable to attend interim follow-up appointments. While shorter immobilization is increasingly adopted elsewhere, a standardized five-week duration ensured consistent management in this retrospective cohort (Table 2).

Cast Revisions and Treatment Modifications

The cast revision rate was significantly higher in the circular cast group than in the dorsoradial cast group (36.1% vs. 22.7%, p=0.038). Cast reinforcement was applied to 10.2% of patients in the dorsoradial cast group and 3.3% in the circular cast group (p=0.039). The need for cast loosening was significantly more frequent in the circular cast group than in the dorsoradial cast group (32.8% vs. 12.5%, p=0.001). The need for surgical intervention after re-reduction was significantly higher in the circular cast group (12.3% vs. 2.3%, p=0.009). The rate of continuing treatment after renewed reduction without surgical intervention was 5.7% in the dorsoradial group and 9.8% in the circular cast group, with no statistically significant difference between the groups (p=0.276) (Table 2).

Functional Outcomes and Complications

There were no statistically significant differences in Knirk-Jupiter arthrosis degree (p=0.197), PRWE scores (p=0.435 for total functional score), and Gartland-Werley assessment (p=0.508). The average final follow-up time was also comparable between groups (mean 122.2 weeks in the dorsoradial cast group vs. 120 weeks in the circular cast group; p=0.946) (Table 2). Subgroup analyses revealed no cast × sex or cast × fracture-type interactions for PRWE (p=0.54) or early revision (p=0.61).

Radiological Outcomes

No statistically significant differences were observed in pre-reduction volar tilt (p=0.201), radial inclination (p=0.743), or radial height (p=0.753) between the dorsoradial cast and circular cast groups. Alignment values immediately after reduction are summarized in Table 3. Volar tilt and radial height were comparable between the two groups (p=0.917 and p=0.144, respectively). However, radial inclination was significantly lower in the dorsoradial cast group (25.44±4.18°) compared to the circular cast group (26.65±3.84°, p=0.043). At the final follow-up, volar tilt (p=0.146) and radial height (p=0.080) showed no significant differences between the two groups. Radial inclination also did not differ between the groups (25.24±4.19° for the dorsoradial cast group vs. 26.15±3.60° for the circular cast group; p=0.070) (Table 3).

Wilcoxon signed-rank tests were used to assess changes in alignment values between post-reduction and final follow-up. As shown in Table 4, both groups experienced significant decreases in volar tilt and radial height during follow-up (p<0.001 for both variables in both groups). While no significant change in radial inclination was observed in the dorsoradial cast group (p=0.057), the circular cast group showed a significant decrease in radial inclination (p<0.001) (Table 4).

DISCUSSION

Distal radius fractures are among the most common fractures in adults. They often present with a bimodal age distribution and account for approximately one-sixth of emergency clinic cases. In this cohort, the mean age (60 years) and median age (62 years) closely align with a large-scale study reporting a mean age of 62.7 years.[10] Furthermore, no significant differ-

Table 3. Comparison of radiologic measurement means

Variable (N=210)	Dorsoradial Cast (n=88) Mean±SD	Circular Cast (n=122) Mean±SD	P-value*
Before Re-duction			
Volar Tilt (°)	-14.83±11.51	-16.96±10.08	0.201
Radial Inclination (°)	10.14±3.22	10.31±3.29	0.743
Radial Height (mm)	1.49±4.95	1.79±5.09	0.753
After Reduc-tion			
Volar Tilt (°)	18.66±6.18	18.53±5.77	0.917
Radial Inclination (°)	25.44±4.18	26.65±3.84	0.043
Radial Height (mm)	14.09±3.64	13.33±3.94	0.144
Final Follow-up			
Volar Tilt (°)	16.76±5.41	15.36±6.53	0.146
Radial Inclination (°)	25.24±4.19	26.15±3.60	0.070
Radial Height (mm)	13.88±4.23	12.70±4.56	0.080

* Mann-Whitney U-Test. P-values were adjusted for multiple comparisons using Bonferroni correction.

Table 4. Differences between post-reduction and final follow-up alignment values

Variable (N=210)	Dorsoradial Cast (n=88)		Circular Cast (n=122)		P-value*
	Mean±SD (Min-Max)	p-value**	Mean±SD (Min-Max)	p-value**	
Volar Tilt After Reduction (°)	13 (1-30)	<0.001	13 (1-23)	<0.001	0.917
Volar Tilt at Final Follow-up (°)	12 (-1-22)		11 (-1-22)		0.146
Radial Inclination After Reduction (°)	20 (13-28)	0.057	21 (13-27)	<0.001	0.012
Radial Inclination at Final Follow-up (°)	13 (6-18)		12 (6-19)		0.070
Radial Height After Reduction (mm)	13 (1-30)	0.006	13 (1-23)	0.001	0.144
Radial Height at Final Follow-up (mm)	12 (-1-22)		11 (-1-22)		0.080

* Mann-Whitney U-Test. ** Wilcoxon Signed-Rank Test.

ences in demographic or clinical characteristics, such as age, sex, AO fracture type, comorbidities, or osteoporosis diagnosis, were observed, enhancing the study's methodological rigor. The predominance of female patients (87.1%) reflects the higher incidence of these fractures in women, consistent with existing literature.

Rundgren et al.[11] reported that AO-23-A2 and AO-23-A3 fractures comprised the majority of cases (53% and 9.3%, respectively), with 82% managed conservatively. Similarly, in the current study, AO-23-A2 and AO-23-A3 fractures represented 86% and 14% of cases, respectively. This similar distribution and treatment approach underscore the widespread use of conservative management for these fracture types, while highlighting the importance of close follow-up to detect instability requiring surgical intervention.

In a prospective, randomized trial, Caruso et al.[12] compared the effectiveness of short-arm and long-arm casts in the conservative treatment of extra-articular distal radius fractures in the elderly population. Their findings demonstrated that short casts were equally effective as long casts in maintaining reduction, with comparable functional outcomes and fewer complications related to elbow immobilization. Similarly, the current study used short casts for extra-articular fractures and observed some deterioration in radiological parameters during follow-up. However, all measurements remained within acceptable limits, and functional outcomes assessed by GW scores were satisfactory in most patients, with only eight showing poor results. These findings support the effective use of short casts in managing extra-articular fractures while minimizing complications.

Seeher et al.[13] emphasized the necessity of surgical intervention for distal radius fractures with signs of instability, such as significant dorsal angulation, intra-articular step-off, or radial shortening. The study by Hoffer et al.[14] on re-reduction supports our findings regarding dorsoradial casting. Their study showed that re-reduction increased surgical rates and failed to maintain radiographic alignment in the long term, reporting a 34.3% surgical rate. Similarly, in the current study, re-reduction was performed when reduction loss occurred during follow-up, and surgical treatment was recommended if instability criteria were met. It was observed that surgical rates were higher in the circular cast group, where re-reduction rates were also more frequent.

Jorgensen et al.[15] reported no cases of compartment syndrome or acute carpal tunnel syndrome in adults treated with short-arm casts for distal radius fractures. In this cohort, no significant complications were observed in either cast group. Proactive monitoring for swelling and pain reduced release rates in the dorsoradial cast group, underscoring the importance of early intervention in fracture management.

The latest radiological measurements in this study are consistent with findings from other studies within the Turkish population. For example, Bilgin et al.[16] reported similar values for volar tilt, radial inclination, and radial height. This consistency strengthens the reliability and applicability of our findings within this demographic.

The higher reinforcement rates observed in the dorsoradial cast group may be attributed to its 3/4 structural design and use of flexible bandages, compared to the rigid design of the circular cast. This design difference may also explain the reduced need for surgical intervention, as the higher release rates in the circular cast group may reflect greater challenges in maintaining cast stability. Early cast revision occurred in 22.7% of dorsoradial cases versus 36.1% of circular casts, corresponding to an absolute risk reduction of 13 percentage points—approximately a 20% relative decrease. This practical advantage constitutes the study's most clinically relevant finding. Consequently, the dorsoradial cast emerges as a viable alternative, particularly in settings with limited follow-up capacity, offering comparable functional and radiological outcomes with fewer modifications. While post-reduction radial inclination was lower in the dorsoradial cast group, this did not compromise final alignment, as all values remained within clinically acceptable limits. Notably, the post-reduction difference in radial inclination averaged only 1.2°, a value well below the 5° minimal clinically important difference proposed as the

threshold for clinically meaningful loss of radial inclination after distal radius fractures. Therefore, this statistically significant gap is unlikely to translate into functional impairment.[17] This difference may be related to the ability of the dorsoradial cast to allow for greater ulnar deviation during positioning due to the ulnar side being left uncast, which increases stabilization. However, further biomechanical studies are needed to validate these observations and explore their clinical implications.

The PRWE questionnaire is a validated tool for assessing wrist pain and disability, consisting of pain and function subsections, with higher scores indicating greater disability. The Turkish version, validated by Öztürk et al.,[18] is routinely recommended for patient-centered evaluations. In this study, both groups exhibited low PRWE scores, indicating effective pain management and functional recovery. These findings are consistent with those of Quax et al.,[19] who reported functional recovery approaching pre-fracture levels within one year. Moreover, the alignment between PRWE scores, radiological parameters, and Gartland-Werley scores in this study reinforces the effectiveness of both casting methods in restoring wrist anatomy and function, while also achieving favorable patient-reported outcomes. This study supports these conclusions by demonstrating successful functional recovery, as reflected in the PRWE scores. Furthermore, radiological parameters and Gartland-Werley scores align with these functional outcomes, highlighting the effectiveness of this treatment protocol in restoring wrist function and anatomy.

A recent study has emphasized the innovative potential of topology-optimized 3D-printed splints, demonstrating their efficacy in enhancing early functional recovery and minimizing complications in the treatment of distal radius fractures.[20] However, the findings of the current study suggest that dorsoradial casts offer a practical alternative, particularly for clinicians working in peripheral hospitals. Due to their ease of application, reduced need for intensive monitoring of acute complications, and greater accessibility, dorsoradial casts appear to be a suitable option in such settings.

A study by Wik et al.[6] compared dorsal cast splints with full circular casts during the first 10 days of treatment for Colles fractures and found no significant differences in radiological outcomes or complications, aside from slight advantages in early pain reduction and patient comfort in the splint group. Similarly, the current study found no radiological differences between treatment groups. However, it also showed that dorsoradial casts required fewer early releases due to swelling or pain, consistent with the findings of Wik et al.[6] Furthermore, in the Wik et al.[6] study, patients were switched to a circular cast after 10 days. In contrast, this study uniquely maintained the use of dorsoradial cast splints throughout the entire treatment period without transitioning to another immobilization method. This approach eliminates the additional workload associated with cast changes in the healthcare system and allows for an evaluation of the long-term efficacy and stability of dorsoradial casts over an average follow-up of more than two years.

Thorninger et al.[21] evaluated long-term outcomes of nonoperatively treated distal radius fractures and reported a 31% prevalence of posttraumatic arthritis after three years, though most cases remained asymptomatic. Similarly, in the current study, the Knirk-Jupiter classification indicated mild to severe radiographic changes in 41.4% of patients. Nevertheless, PRWE and Gartland-Werley scores demonstrated satisfactory functional outcomes in the majority of cases. These findings reinforce the notion that radiological changes do not necessarily correlate with poor functional outcomes, aligning with previous literature on nonoperative DRF management.

This study has several limitations. First, its retrospective, single-center design introduces inherent selection and information bias, and treatment allocation was based on surgeon preference rather than randomization. Second, although every patient was followed for at least 12 months, the length of follow-up varied considerably (86-162 weeks), which may affect the comparability of late outcomes. Third, all radiographic measurements were performed by a single observer, so inter-observer reliability could not be assessed and measurement bias cannot be excluded. Fourth, while baseline covariates (age, sex, osteoporosis status, fracture pattern) were similar between groups, no multivariable adjustment was performed; thus, residual confounding—particularly regarding the lower early-revision rate with dorsoradial casting—may persist.

Both dorsoradial and circular casts proved adequate for the conservative management of dorsally angulated, extra-articular distal radius fractures, yielding similar long-term functional and radiographic results. Importantly, dorsoradial casts required markedly fewer early cast releases and reinforcements, reducing unplanned clinic visits and operative conversions. Because they are easy to apply, better accommodate post-reduction swelling, and minimize the need for frequent follow-up, dorsoradial casts offer a pragmatic alternative for clinicians working in peripheral or resource-limited settings. These findings support incorporating the dorsoradial technique into conservative treatment pathways when frequent monitoring cannot be guaranteed.

Ethics Committee Approval: This study was approved by the Uşak University School of Medicine Non-Interventional Clinical Research Ethics Committee (Date: 02.03.2023, Decision No: 84-84-14).

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ORİJİNAL ÇALIŞMA - *ÖZ*

Distal radius kırıklarında dorsoradial ve sirküler alçının karşılaştırılması: Retrospektif karşılaştırmalı kohort çalışması

AMAÇ: Eklem dışı, dorsal açılı distal radius kırıklarının (DRK) konservatif tedavisinde en uygun alçı tasarımı tartışmalıdır. Ulnar kenarı açık bırakan dorsoradial (DR) alçının şişmeye uyum sağlayarak erken alçı müdahalesi gereksinimini azaltabileceği öne sürülmektedir.

GEREÇ VE YÖNTEM: Mayıs 2019-Mayıs 2023 arasında AO-23-A2/A3 DRK tanısı alıp beş hafta immobilize edilen yetişkinler tek merkezli geriye dönük kohorta dâhil edildi. Hastalar DR alçı (n=88) veya dairesel alçı (DA; n=122) aldı. Birincil sonlanımlar: Hasta Değerlendirmeli El Bileği Skoru (PRWE), Gartland-Werley (GW) kliniği ve radyolojik açı-ölçüleri (volar tilt, radial inklinasyon, radial yükseklik) – medyan 118.5 haftada. İkincil sonlanımlar: erken alçı revizyonu (gevşetme/takviye) ve komplikasyonlar. İstatistik: Mann-Whitney U, χ^2/Fisher; çoklu karşılaştırmada Bonferroni düzeltmesi ($\alpha\_adj=0.017$).

BULGULAR: Gruplar yaş (ortalama 60±11 yıl), cinsiyet (%87 kadın), AO alt tipi ve osteoporoz açısından benzerdi.

Erken revizyon: DR %22.7 vs DA %36.1 (mutlak risk azalması 13 puan; OR 0.51; p=0.038); fark en çok şişme/ağrı için alçı gevşetmede görüldü (%12.5 vs %32.8; p=0.001). Fonksiyon: PRWE 34±18 (DR) vs 36±18 (DA); p=0.435. GW'de iyi-mükemmel oranı %79.5 vs %77.8; p=0.508. Radyoloji: Son volar tilt ve radial yükseklik farkı yok (p>0.08). DR alçı radial inklinasyonu korudu (medyan değişim 0°, p=0.057); DA alçıda 1.3° kayıp vardı (p<0.001). Gruplar arası net 1.2° fark, 5°'lik MCID eşiğinin altındadır ve klinik açıdan önemsizdir. Hiçbir hastada kompartman sendromu veya akut karpal tünel sendromu görülmedi.

SONUÇ: Dorsoradial alçı, fonksiyonel ve radyolojik açıdan dairesel alçıya eşdeğer sonuç verirken erken alçı revizyonu gereksinimini beşte bir oranında azaltır. Bu sayede plan dışı poliklinik ziyareti ve operasyon ihtiyacını düşürerek, takip kapasitesi kısıtlı kliniklerde dorsal açılı, eklem dışı DRK'nın konservatif tedavisinde pratik bir alternatif sunar.

Anahtar sözcükler: Dairesel alçı; distal radius kırığı; dorsoradial alçı; konservatif tedavi; PRWE.

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