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Clinical Research Article

Clinical Observation on the Efficacy of Pingle Guo's Bone-Setting Manipulation Combined with Different Traction Methods in Treating Unstable Distal Radius Fractures

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Abstract

Objective: To compare the clinical effects of Pingle Guo's orthopedic manipulation combined with neutral plate traction versus orthopedic manipulation combined with finger-cuff suspension traction in the treatment of unstable distal radius fractures. **Methods:** A prospective study was conducted on adult patients with unstable distal radius fractures treated in the Pingle Guo Orthopedics Department of Shenzhen Pingle Orthopedics Hospital from January to June 2024. Patients were divided into two groups: the experimental group received finger-cuff suspension traction, and the control group received neutral plate traction. The pre-reduction and post-reduction palmar tilt angle, ulnar deviation angle, radial height recovery, and Cooney wrist scores were recorded for both groups. **Results:** Before reduction, there were no statistically significant differences between the two groups in radiological indicators such as palmar tilt angle, ulnar deviation angle, radial height recovery, or Cooney wrist scores ($p>0.05$). After reduction, there were statistically significant differences between the two groups in terms of radial height recovery and Cooney score functional indicators ($p<0.05$). No significant differences were observed between the two groups in other indicators. **Conclusion:** Both neutral plate traction and finger-cuff suspension traction have good effects in the manual reduction treatment of patients.

Distal radius fractures (DRFs) represent the most common upper extremity fractures in middle-aged and elderly populations, accounting for 5.1% of all fractures and 48.37% of wrist fractures [1]. Treatment selection depends on fracture instability [2,3]. Radiographic indicators of instability necessitating surgical intervention include: dorsal comminution exceeding 50% of the dorsovolar distance, volar metaphyseal comminution, initial dorsal tilt >20°, initial translation >1 cm, initial shortening >5 mm, intra-articular involvement, concomitant ulnar fracture, and severe osteoporosis [4]. Although surgery achieves satisfactory reduction, complications such as loss of reduction, malreduction, extensor tendon irritation, hardware migration, traumatic arthritis, and functional impairment impede optimal outcomes [5,6].with distal radius fractures. However, finger-cuff traction is superior to neutral plate traction in terms of radial height recovery and functional outcomes, making it worthy of clinical application.

Keywords: Distal radius fractures; Finger-cuff suspension traction; Neutral plate traction

Objective

To compare clinical outcomes of Pingguo manual reduction combined with either finger trap suspension traction (FTST) or neutral plate traction (NPT) in unstable DRFs.

Methods

Design: Randomized controlled trial (60 patients; 30 per group).

Setting: Department of Orthopedics, Shenzhen Pingguo Orthopedic Hospital (Jan-Jun 2024).

Ethics: Approved by Institutional Review Board (No. KY2024010); written informed consent obtained.

Participants: Adults (>18 years) with unstable DRFs meeting ≥1 instability criterion. Exclusion criteria: open/pathological/old fractures, pre-existing dysfunction, inadequate closed reduction (radial shortening <2 mm, ulnar variance <5 mm, articular step-off <2 mm, volar tilt loss <10°), or cognitive impairment.

Interventions

a. FTST Group: Hematoma anesthesia with 1% lidocaine; 30-min gravity-assisted FTST followed by Pingguo reduction and splinting. Home-based FTST (1 hour, twice daily for 2 weeks).

b. NPT Group: Identical reduction/splinting protocol. Home-based NPT using a handle-equipped plate to generate longitudinal traction (dosing identical to FTST).

Outcomes

a. Radiographic: Volar tilt, ulnar inclination, radial height (pre-reduction, immediate post-reduction, 1/2/3 months).

b. Functional: Modified Cooney wrist score at 3 months.

Statistical Analysis

SPSS 24.0; χ^2-test for categorical data; independent t-tests for continuous data (mean ± SD); significance at $P < 0.05$.

Results

1. Baseline radiologic parameters were comparable ($P > 0.05$). At 3 months:

- Both groups showed significant improvement in all parameters.
- FTST group exhibited superior radial height restoration vs. NPT ($P < 0.05$).
- No intergroup differences in volar tilt or ulnar inclination.

2. Functional outcomes (modified Cooney score):

- FTST group demonstrated better functional status ($P < 0.05$).
- No differences in pain, grip strength, dorsiflexion, or palmar flexion.

3. No adverse events occurred in either group.

Discussion

Conservative management remains valuable for DRFs, particularly for patients declining surgery. Our findings confirm that Pingguo manual reduction achieves satisfactory initial alignment, consistent with prior studies [8,9]. However, maintaining reduction is challenging due to loss of traction, cancellous bone defects, dorsal "negative support" [10], increased radiocarpal stress from radial shortening [11], muscle spasm, edema resolution, and early mobilization [11,12]. Radial shortening contributes to ulnar impaction, ulnocarpal impingement, restricted motion, and pain [13,14].

FTST provides sustained longitudinal traction, counteracting muscular forces and promoting fracture consolidation [7]. Both traction methods effectively reduced secondary displacement and reoperation risk. FTST's superiority in restoring radial height and functional status may stem from greater axial traction force compared to NPT's transverse mechanism. Preserved radial height mitigates distal radioulnar joint instability and ulnocarpal impingement, explaining FTST's functional advantage.

Conclusion

Both FTST and NPT combined with Pingguo reduction are viable for unstable DRFs. FTST demonstrates superior efficacy in restoring radial height and functional outcomes, making it the preferable conservative option. Patient preference and informed consent remain crucial in clinical decision-making.

Group	n	Volar Tilt (°)		UlnarInclinatin(°)		Radial Height (mm)	
		Pre-red	3mo Post	Pre-red	3mo Post	Pre-red	3mo Post
FTST	30	-13.52 ± 14.87	11.3 ± 6.67	14.1 ± 5.65	19.13 ± 4.98	-2.14 ± 3.64	3.75 ± 2.6
NPT	30	-14.03 ± 15.13	10.0 ± 5.79	14.2 ± 4.15	18.87 ± 4.42	-2.44 ± 3.19	2.04 ± 2.82
***t*-value**		0.13	0.81	-0.08	0.21	0.34	2.45
P-value		>0.05	>0.05	>0.05	>0.05	>0.05	<0.05

Table1: Comparison of the ulnar deviation angle, volar tilt angle, and shortening distance of the distal radius height between the two patient groups before reduction and 3 months after reduction based on X-ray image.

Group	n	Pain		Functional Status		ROM		Grip Stren	
		Pre-red	3mo Post	Pre-red	3mo Post	Pre-red	3mo Post	Pre-red	3mo Post
FTST	30	7.5± 7.63	22.67 ± 3.14	7.33± 8.07	23.83 ± 2.15	6.17 ±4.86	22.66± 4.3	5.83± 4.93	20.67 ± 5.04
NPT	30	7± 7.61	21.83 ± 3.34	7.17± 7.84	22.32 ± 2.86	5.67 ± 3.88	20.66 ± 5.21	5.5± 4.42	20.83 ± 5.27
***t*-value**		0.25	1	0.08	2.32	0.44	1.62	0.27	-0.12
P-value		>0.05	>0.05	>0.05	<0.05	>0.05	>0.05	>0.05	>0.05

Table 2: Comparison of Cooney wrist scores between two patient groups before reduction and 3 months after reduction.

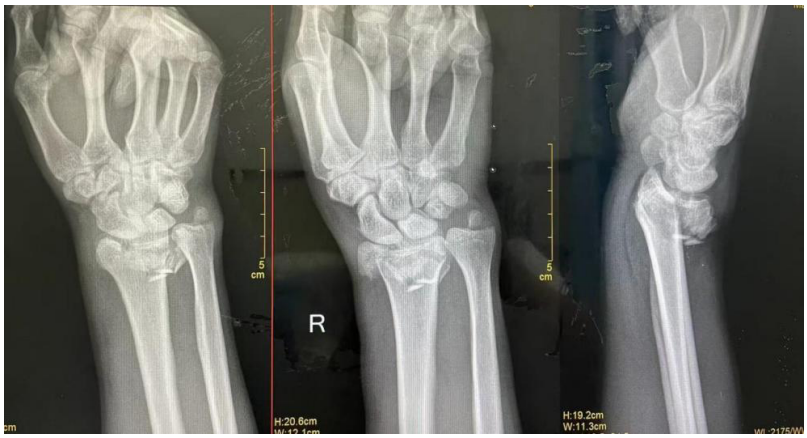

Figure 1: Before reduction.

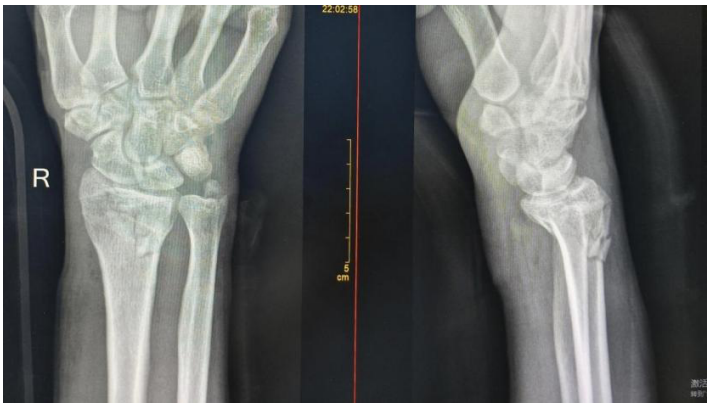

Figure 2: After reduction.

Figure 3: Two months after reduction.

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Author Contributions

Longfei Wen: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft.

Wei Li: Data curation, Formal analysis.

Yan Zhang: Supervision, Validation, Writing – review & editing, Project administration.

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