

# A Retrospective Study on Recovery of Joint Function of Distal Radial Fracture After Treated with Wei's Traumatology Guidance combined with Limbs Fumigation Fang

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## Research

**Keywords:** Distal radius fracture, Wei's Traumatology Guidance, Limbs Fumigation

**Posted Date:** September 10th, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-70692/v1>

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# Abstract

**Objective:** To explore the clinical effect on recovery of joint function of distal radial fracture after treated with Wei's Traumatology Guidance combined with Limbs Fumigation Fang.

**Methods:** A retrospective analysis was conducted on 84 patients with distal radius fracture. The cases were collected from October 2017 to July 2018 in Ruijin Hospital Affiliated to Medical College of Shanghai Jiao tong University. The fractured radius of patients was firstly fixed and then treated with Wei's traumatology guidance combined with Limbs Fumigation Fang. After that, the G-W wrist function, self-rating scale (PRWE) and simplified sf-36 health scale were used to analyze the recovery of joint function of distal radial fracture before and after treatment.

**Results:** There were significant differences in wrist function evaluation, wrist patient self-rating scale (PRWE) and simplified SF-36 health scale before and after treatment ( $P < 0.05$ ). After treated with Wei's Traumatology Guidance combined with Limbs Fumigation Fang for 3 weeks, the wrist pain, range of motion, strength and quality of life were improved a lot than before.

**Conclusion:** Wei's Traumatology Guidance combined with Limbs Fumigation Fang is an ideal way to restore wrist function with definite curative effect and high safety.

## Background

Distal radius fractures (DRF) are one of the most common types of fractures in orthopedics<sup>[1, 2]</sup>. With an ageing population, the incidence of distal radius fracture is increasing<sup>[3, 4]</sup>. Currently, there are two main methods for treating distal radius fractures, surgical and nonsurgical<sup>[1, 5-7]</sup>. However, whichever the method is adopted, there will still be different degrees of wrist joint dysfunction, such as pain, swelling, joint range of motion and strength decline after fracture, affecting the daily life and work<sup>[8, 9]</sup>. It is of great significance to explore a simple, effective and scientific functional rehabilitation exercise. Wei's Traumatology Guidance is with the long history in Ruijin Hospital Affiliated to Shanghai Jiao Tong University School of Medicine which has been widely used in various diseases of orthopedics and traumatology with the effective prognosis. We retrospectively analyzed the patients who received fixation treatment for distal radial fractures in the orthopedics department of Ruijin Hospital from October 2017 to July 2018 and founded Wei's Traumatology Guidance combined with Limbs Fumigation Fang is an ideal way to restore wrist function with definite curative effect and high safety.

## 1 Patients And Methods

### 1.1 Patients

From October 2017 to July 2018, a total of 84 patients were enrolled in this study. All the patients were with poor joint movement after treatment of distal radius fractures in the orthopedic clinic of Ruijin

Hospital affiliated to Shanghai Jiao Tong University School of Medicine who received Wei's traumatology guidance combined with limbs fumigation fang washing.

## 1.2 Inclusion criteria

1 18-85 years old with the defined diagnosis of distal radius fracture;

2 The patients were fixed with small splint, plaster external fixation, external fixator and internal fixation, and the external fixation was removed or the surgical incision was healed and stitches were removed;

3 The fracture has been relatively stable, callus growth is well, X - ray fracture line is fuzzy;

4 Patients were with the wrist movement disorder, pain, swelling, weakened muscle strength;

5 The patients are with good compliance, receiving guidance and herbal fumigation and cooperate with doctors to do follow-up work.

## 1.3 Exclusion criteria

1 Fracture malunion or poor fracture union, without tolerating guided treatment;

2 The patient's skin is prone to allergy and cannot be cured by Chinese medicine fumigation;

3 There is nerve damage in the affected limb and the prognosis is poor

4 The patient has severe osteoporosis and other serious underlying diseases.

If any of the exclusion criteria is met, the patient will not be included in the study.

## 1.4 Methods

### 1.4.1 Treatments

All the cases were treated with Wei's Traumatology Guidance combined with Limbs Fumigation Fang without adopting other treatment regimens. The intervention time of Wei's Traumatology Guidance was from the day of enrollment to 3 months after fracture, and the intervention time of Limbs Fumigation Fang was 3 weeks from enrollment.

#### 1.4.1.1 Wei's Traumatology Guidance

##### Rolling Fists Guidance

The patients take the standing or sitting position with both hands clenched into fists. During exercise, the patients need to bend the elbows and place arms opposite each other in front of chest, then roll fists inward and outward from chest. In the process of rolling, the two fists should be made from the back to the ulnar, palmar and radial sides from the inside to outside and make sure the exercise have relative contact to make a circle roll. After rolling a circle from the inside to outside, make the opposite direction to rolling a circle from the outside to inside as required before. Due to the motion of the wrist joint of the patient is limited, so the activity of patients will be flexible after exercise. After the end of the scrolling, from the inside to outside, and then from the outside to inside as a section, mild:10-20 sections, severe: increasing from 3-5 sections gradually, exercise 2-3 times a day.

### **☒Holding Palm Guidance☒**

The patients take the standing or sitting position with fingers clasped and then bend the elbows inward and press palms to chest, subsequently turn the thumbs down in front of palms, gradually straighten elbows and push palms forward. In the process of pushing straight, the fingers must always buckle tight without relaxing. The pain of the wrist should be tolerated, then rotate the hands to center position and draw them back to the chest for a second action. A completely action is a section. Mild:10-20 sections, severe:5-10 sections, exercise 2-3 times a day.

### **☒Golden Nodding Guidance☒**

Patients should bend the thumb to the center of palm, then squeeze the thumb and make a fist. With the forearm in the middle position, lift the fist as far as possible to the radial side for extreme and then bend it to the ulnar side for extreme. During the exercise, the hand couldn't lose and should rely on wrist to exert strength completely. A lift and a bend as a section. Mild:15-30 sections, severe:5-10 sections, the sections could be increased gradually according to the symptom, exercise 2-3 times a day.

### **☒Holding Fingers Guidance☒**

The patients take the standing, sitting position or clinostatism with the fingers slightly flexion. The end of the fingers of both hands is closely relative to the abdomen, push the fingers as far apart as possible with equal force. A flex and a loose (a loose and tight) as a section. Mild:10-20 sections, severe:5-10 sections, exercise 2-3 times a day.

## **1.4.1.2 Washing With Limbs Fumigation Fang☒**

The components of limbs fumigation fang: ramulus mori 9g, cassia twig 9g, radix cyathulae12g, safflower 6g, Papaya Pickle 6g, Rhizoma Dioscoreae Tokoro 9g, Centella asiatica 9g, Chinese angelica 9g, fructus psoraleae 9g, Notopterygium incisum 9g, radix angelicae pubescentis 9g.

Preparation method: Put the medicine into a pot with water, and then fume and wash the affected area with the boiled decoction, 2-3 times a day, each time about 30 minutes. Each dose lasts 2-3 days. Ruijin

Hospital also has extremities to wash the hospital preparation particles, 1 bag a day, 2-3 times a day.

## 1.5 Method of efficacy evaluation

### 1.5.1 Gartland and Werley's G-W Wrist function assessment Scale<sup>[10]</sup>

This assessment scale is based on a demerit point system which involves an objective evaluation of wrist function. It relies on the concept that a minimum of 45° dorsiflexion, 30° palmar flexion, 15° ulnar and radial deviation and 50° pronation and supination is normal. Demerit points are given based on the presence of a specific arbitrarily determined degree of loss of range of movement<sup>[11]</sup>.

G-W wrist function evaluation method was used to evaluate wrist function of patients before and after treatment (3 months after fracture), and wrist function was divided into 4 grades.

### 1.5.2 Patient Rated Wrist Evaluation Questionnaire (PRWE)<sup>[12]</sup>:

The aim of the questionnaire is to provide a reliable and valid tool for quantifying patient-rated wrist pain and disability in order to assess outcome in patients with distal radius fractures<sup>[11]</sup>. There are 15 items including pain and function, with a total score of 100. The score of 10 small items related to activity and function will be divided by 2 (full score is 50), and then add the total score of the pain items, so as to obtain a value in the range of 0-100. The higher the score, the more severe the pain and dysfunction is. This scale was used to evaluate wrist joint status of patients before and after treatment (3 months after fracture).

### 1.5.3 The simplified SF-36 Health Assessment Scale:

Distal radial fracture was a low correlation with the SF-36 mental summary score and a high correlation with bodily pain score and physical function score. This simplified SF-36 health assessment includes two parts: physical health (the highest score is 30, the lowest score is 10) and physical function (the highest score is 8, the lowest score is 4). The higher the score, the better the patient's health condition is. On the contrary, the worse it is.

## 1.6 Statistical Analysis

SPSS23.0 software was used for statistical analysis, rank sum test was performed on the grade data, paired t-test was performed on the measurement data, and the test level = 0.05.  $P < 0.05$  was statistically significant.

## 2 Results

### 2.1 Patients

A total of 84 patients were enrolled in the study, and none of them fell off or had adverse reactions. There were 25 males and 59 females with 44 cases of left fracture and 40 cases of right fracture. Among the AO types, there were 32 cases of Type A, 34 cases of type B and 18 cases of type C. 66 cases were treated conservatively, and 18 cases were treated surgically. In addition, age, fracture time, fixation time, and time from removal to inclusion are shown in Table 1.

Table 1  
General information of patients after fixation of distal radius fractures

	Age [years]	fracture time[d]	fixation time[d]	The time from external fixation to enrolling the study[d]
Mean	49.54	45.31	39.46	5.79
Standard deviation	9.87	5.17	4.32	2.28

### 2.2 The evaluation of wrist function of Gartland and Werley (G-W) before and after treatment

The comparison of the wrist function of Gartland and Werley (G-W) before and after treatment suggests the statistically significant  $P=0.000<0.05$ . After being treated with the Wei's Traumatology Guidance combined with Limbs Fumigation Fang for 3 weeks, the function of wrist has been improved significantly, and the excellence rate is 55.95% the results are concluded in table 2.

Table 2  
The comparison of G-W wrist function before and after treatment

Time	The evaluation of wrist function of Gartland and Werley (G-W)				Z value	P value
	perfect	good effect	improvement	bad effect		
Before treatment	0	2	56	26	-11.426	$<0.05$
After treatment	47	36	1	0		

### 2.3 The comparison of Patient Rated Wrist Evaluation Questionnaire (PRWE) before and after treatment

The comparison of the Patient Rated Wrist Evaluation Questionnaire (PRWE) before and after treatment indicated the statistically significant ( $P=0.000<0.05$ ). After being treated with the Wei's Traumatology Guidance combined with Limbs Fumigation Fang for 3 weeks, Both the pain, function and overall evaluation were superior to before, and the wrist function recovery was relatively ideal. The results are concluded in table 3.

Table 3  
The comparison of the PRWE before and after treatment

Time	The evaluation of wrist function by PRWE			The comparison of total scores	The comparison of total scores P value
	pain	function	Total scores	t value	
Before treatment	24.23±4.48	35.67±5.39	60.06±6.49	-55.18	$<0.05$
After treatment	5.88±3.15	11.36±4.51	17.83±3.43		

## 2.4 The comparison of evaluation of Simplified SF-36 Health scale before and after treatment

The difference of the comparison of evaluation of Simplified SF-36 health scale before and after treatment has the statistically significant ( $P=0.006<0.05$ ). After being treated with the Wei's Traumatology Guidance combined with Limbs Fumigation Fang for 3 weeks, the physical health and physical function of patients are significantly better than before. The patients have the healthy life, which greatly reduces the impact of fracture on daily life. The results are concluded in table 4.

Table 4  
The comparison of evaluation of Simplified SF-36 Health scale before and after treatment

Time	The evaluation of Simplified SF-36 Health scale			The comparison of total scores	The comparison of total scores P value
	The body health	The body function	Total scores	t value	
Before treatment	14.21±3.47	5.46±2.11	20.02±3.77	-21.68	$<0.05$
After treatment	26.44±2.88	7.39±1.97	31.67±3.16		

## 3 Discussion

Complex regional pain syndrome type I (CRPS I) is one of the common complications after the treatment of distal radius fractures. Whatever the fracture of distal radius is treated by plantlet, gypsum and other

non-surgical methods or the surgical methods like the internal fixation. In these distal radius fractures cases, the incidence of CRPS I varies from 1–37%<sup>[13, 14]</sup>. It leads to local wrist pain (spontaneous or induced), increases sensitivity to tactile stimulation, swelling, vasodilation, and abnormal sweating (sympathetic dysfunction); and impairment of motor function (weakness, tremor, and muscle spasm)<sup>[14]</sup>. The decline of wrist joint function will bring great influence on the daily life and work of patients with distal radius fracture. So the primary goal is to pursue the recovery of wrist function<sup>[15, 16]</sup>. At present, there are many rehabilitation methods to promote the recovery of wrist joint function however, a large part of treatments relies on instruments and equipment which is cumbersome to operate and difficult for patients to adhere to. This study introduces a relatively simple exercise method which is easy for patients to learn and accept. This way is consistent with the concept of attach equal importance to muscles and bones and doctor-patient cooperation in the four basic principles of integrated Traditional Chinese and Western medicine proposed by professor Shang Tianyu, a famous Chinese expert on bone injury of traditional Chinese medicine has been engaged in the research on bone injury of integrated Traditional Chinese and western medicine<sup>[17]</sup>. And later, the functional rehabilitation exercise should focus on the 'tendon', so that the bone and the tendon could be treated together. At the same time, the patients need cooperate with the doctor to complete the functional rehabilitation together. Consequently, the instruction by doctor and the rehabilitation exercise by patients are both important for the postoperative fixation of distal radius fractures. Reasonable functional rehabilitation exercise has a good effect on relieving local wrist joint adhesion, enhancing wrist joint activity and strength, and improving the quality of life.

Wei's Traumatology is one of the famous traumatology academic schools in China<sup>[18]</sup>, and it's one of the 'eight schools' in Shanghai's traumatology. Its unique Wei's traumatology technique, guidance, internal medicine, external dressing treatment of orthopedic diseases has a significant effect. The Wei's Traumatology Guidance is formed gradually by combining the guidance documents of doctors in the past dynasties and drawing on the folk experience. It is mainly a treatment method for preventing and treating bone injury diseases by active movement of limbs, partly combined with breathing to promote the recovery of bone injury diseases and improve the changes of the organism and function.

Wei's Traumatology Guidance includes both the whole and the local aspects. The former is the overall concept and the comprehensive movement of limbs in various parts of the body, while the latter is the functional activity of certain joints and limbs. In most cases, the overall movement of the limbs and partial movement of the joints are often combined with each other in Wei's Traumatology Guidance. When the guidance is applied to fracture, we should pay attention to 'integration of motion and quietness'. 'quietness' maintains the stability of the broken end and prevents new injury. 'motion' makes the body active and promotes the recovery of body function.

Wei's Traumatology Guidance is one of self-training ways to restore joint function and it's easy to operate so that make the wrist joints full of movement, release adhesion, increase synovial fluid.

The Limbs Fumigation Fang has been used in Ruijin hospital for Dozens of years with the effects of smoothing joints, warming channels and collaterals, activating blood and dispelling wind. The main

indications are muscle and collateral damage and poor joint action, where the mulberry branch, cassia twig, ox knee, papaya, psoraleae warm the joint of the extremities. beyond that the Limbs Fumigation Fang contains Safflower, angelicae, Centella asiatica, Notopterygium radix angelicae pubescentis and Dioscorea septemloba Thunb. Safflower and angelicae contain chemicals that may thin the blood to prevent clots, widen blood vessels, lower blood pressure<sup>[19, 20]</sup>. Centella asiatica's active compounds include pentacyclic triterpenes, mainly asiaticoside, madecassoside, asiatic acid and madecassic acid<sup>[21]</sup>. Centella asiatica has also been found beneficial in chronic venous insufficiency, mainly by improvement of microcirculation<sup>[22]</sup>. In addition, Notopterygium radix angelicae pubescentis have been used over the years to disperse cold, prevent painful obstructions from wind, damp and warm pain. These have also been used with other herbs to treat wind-cold exterior syndrome and wind-cold-damp bi-syndromes<sup>[23, 24]</sup>. Dioscorea septemloba Thunb has also been shown to have anti-inflammatory effects<sup>[25]</sup>, and also could treat wind-cold-damp bi-syndromes. All the Chinese herbal medicine work together to improve blood circulation, reduce pain, and activate joints.

Our study indicated that the comparison of G-W wrist function evaluation, wrist self-rating Scale (PRWE) and simplified SF-36 health scale before and after treatment showed statistically significant differences ( $P < 0.05$ ). After the treatment with Wei's Traumatology Guidance combined with Limbs Fumigation Fang for 3 weeks, the pain of wrist, range of motion, strength and quality of life were significantly better than before. Wei's Traumatology Guidance combined with Limbs Fumigation Fang could effectively promote the recovery of wrist function. However, this retrospective study also has its shortcomings. In the future, a large sample multi-center prospective controlled study will be carried out to enhance the credibility, and at the same time, the follow-up time will be extended to lay a foundation for the observation of long-term effects.

## Conclusion

In general, Wei's Traumatology Guidance combined with Limbs Fumigation Fang is a practical, simple and economical treatment for the patients with distal radius fractures fixed. It has the significantly effect on improving the joint pain, mobility, strength with the high safety and clinical utilization that deserves further research and clinical application.

## Declarations

## Acknowledgements

Not applicable

## Funding

This work was supported by the Three year action plan for further accelerating the development of TCM in Shanghai (2018-2020) (No. ZY - (2018-2020) - CCCX -1011), Shanghai Sailing Program [No.20YF1427400], the Key Scientific Research Project of Shanghai Municipal Commission of Health and Family Planning (No.201640021), the Li Feifei national famous TCM expert inheritance studio (No. MLZJGZS-2017001), Shanghai famous TCM Li Feiyue's academic experience research studio (No. SHGZS-2017010).

## Availability of data and materials

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

## Authors' contributions

Wei Yan and Bo Kong participated in designing the study, interpreting the findings, and drafting the manuscript. Tao Jiang participated in interpreting the findings and critically revising the manuscript. ChangGui participated in designing the study, interpreting the findings, and critically revising the manuscript. Hao Tiao provided statistical analysis, and participated in interpreting the findings and critically revising the manuscript. ZhengYue Miao and XiaoBing Xi participated in interpreting the findings and critically revising the manuscript. All authors read and approved the final manuscript.

## Ethics approval and consent to participate

The study was approved by the Ruijin Hospital ethics committee; all legal representatives of the study participants gave written informed consent

## Consent for publication

Not applicable.

## Competing interests

Not applicable.

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