RMJ Ramathibodi Medical Journal

Rama Med J | Original Article

Outcome and Related Factors in Patients With Distal Radius Fracture After Rehabilitation Treatment

Tachit Jiravichitchai[1], Thirut Pornthawesub[1], Monratta Panuwannakorn[1]

[1] Department of Rehabilitation Medicine, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok, Thailand

Background: Distal radius fracture is the most common forearm fracture in elderly people. Rehabilitation after the fracture could increase effectiveness of treatment as it could reduce pain and increase range of motion and strength of hand and wrist.

Objective: To study the outcome and related factors in patients with distal radius fracture after rehabilitation treatment.

Methods: The medical record of 30 patients diagnosed with distal radius fracture received rehabilitation treatment with at least 1-year follow-up period was reviewed. Primary outcome included pain, range of motion, grip strength, and deformity were combined to calculate the total score of modified scoring system for functional assessment. Secondary outcome was severity of fracture, treatment method, duration from fracture to rehabilitation treatment and rehabilitative facilities which were also analysed regarding the primary outcome.

Results: Most good outcome was reported at 6 months after fracture. Only grip strength required a year to improve. Patients with poor outcome were mostly found in severely fractured group (15/16, 93.8%) with $P < .001$. The overall total score turned good at 12 months after fracture. Other factors showed no significant correlation with primary outcome ($P > .05$).

Conclusions: Overall outcome was considered good at 12 months after fracture. Severe type of fracture predicted poorer outcome compared with mild type with statistical significance. No statistically significant difference was reported between patients received rehabilitation earlier and later than 2 months in accordance with treatment methods and rehabilitation settings.

Keywords: Distal radius fractures, Physical and rehabilitation medicine, Hand function

Rama Med J: doi:10.33165/rmj.2022.45.1.254019

Received: October 20, 2021 **Revised:** March 15, 2022 **Accepted:** March 24, 2022

Corresponding Author:
Tachit Jiravichitchai
Department of Rehabilitation Medicine, Faculty of Medicine Ramathibodi Hospital,
Mahidol University,
270 Rama IV Road, Ratchathewi,
Bangkok 10400, Thailand.
Telephone: +66 2201 1154
Fax: +66 2201 2228
E-mail: tachit.jir@mahidol.ac.th

Introduction

Distal radius fracture is the most common forearm fracture among one over six of all bony fractures in people aged over 50 years. Older adults seem to suffer from complications affecting arm and hand use in daily activities. Their quality of life is subsequently affected.[1, 2]

There was a study focusing on age of patients conducted by Cowie et al[3] revealing that aging patients had more severe pain with much decreased motion of hand and wrist joints which still affected arm and hand use after treatment.[3] Likewise, the study of van Leerdam et al[4] also found that the elderly patients had less satisfactory treatment outcome than young patients.

The results of radiographic parameters related to treatment outcome from the study of Jakim et al[5] and Lauder et al[6] showed that lower radial tilt angle brought about better ability of hand and wrist use. Cai et al[7] also found that radial height and volar tilt angle largely related to treatment outcome.

Additionally, the study of van Leerdam et al[4] revealed that patients receiving conservative treatment had more capability to use their hands than those receiving surgical treatment.

In terms of rehabilitation, Michlovitz et al[8] reported that rehabilitation after distal radius fracture could increase effectiveness of treatment as It could reduce pain, increase range of motion, and increase strength of hand and wrist.

Regarding assessment of these patients, the distal radius working group (DRWG) of the international society for fracture repair and the international osteoporosis foundation suggested the inclusion of grip strength, range of motion, activities' limitation, pain, and upper extremity-specific patient-reported outcome.[9] Disabilities of the arm, shoulder, and hand (DASH) and patient-rated wrist/hand evaluation (PRWHE) forms are mostly used.

DASH is a set of 30 questions about the ability of arm and hand use. Low scores refer to good ability of arm and hand. Although DASH is a popular standard form for assessment of arm and hand use, the form is not particular for the use of wrist and the score was reported subjectively by patients. Apart from these drawbacks, the assessment also consumes much time.[10]

PRWHE is a set of 15 questions exploring the use of hand and wrist in the daily life. The upside is specificity of wrist and hand use. As well as DASH, the score was reported subjectively by individual.[10]

Modified scoring system for functional assessment used in our study was brought from the study "The Effect of Fracture-Related Factors on the Functional Outcome at 1 Year in Distal Radius Fractures" by Batra et al.[11] It was published in the *Injury-International Journal of the Care of the Injured* in 2001. This form covers pain assessment, wrist and forearm range of motion, grip strength, and also fracture deformity. The assessment is mainly performed by an assessor with objective results.

The benefit of using this assessment tool is the data including pain description by patients, range of motion of wrist and forearm and, hand grip strength which were routinely and practically examined in our hand clinic. The deformity, one of collective data, was not collectable from the medical record, but it could be gathered by imaging review of plain wrist and forearm film at the period between 6 and 12 months after fracture onset.

From the previous literature review, there were studies about treatment methods (surgical and conservative procedure), fracture severity, and duration from injury to rehabilitation, but there was no study about rehabilitation setting (hospital and home based).

This study aimed to assess the outcome by modified scoring system for functional assessment in patients with distal radius fracture following rehabilitation treatment.

Methods

Participants

Patients aged 18 years or older, presented with distal radius fracture at Ramathibodi Hospital for either surgical or nonsurgical procedures, were included. They were transferred for rehabilitation treatment at least for 12 months continuously. The data in medical record must be complete. Patients with previous joint stiffness and wrist

deformity due to arthritis, previous distal radius fracture, wrist or forearm deformity, and communication problems were excluded.

From the medical record review by ICD-10 search of patients with distal radius fracture at our hand clinic between 2015 and 2019, 33 patients were registered. Three patients were excluded due to inability to follow-up continuously in 1 year. The rests met our inclusion criteria.

Ethics

The study was approved by the Human Research Ethics Committee of Faculty of Medicine Ramathibodi Hospital, Mahidol University (No. MURA2019/1097 on November 6, 2019). The request letter from the Dean of the Faculty of Graduate Studies was sent to the Head of the Rehabilitation Medicine Department for permission and cooperation for collection of the data.

Study Design

This study was an observational retrospective study with data collection from the medical record between 2015 and 2019 (due to the limitations in period of electronic medical record) in 30 patients with distal radius fracture transferred for rehabilitation treatment at Hand Clinic of Department of Rehabilitation Medicine, Faculty of Medicine Ramathibodi Hospital, Mahidol University.

Intervention

We reviewed the data from the medical records and imaging studies of patients diagnosed as distal radius fracture transferred for rehabilitation treatment at our hand clinic at least 1 year after fracture onset. Patients with the hospital-based program received rehabilitation treatment 1 to 2 times per week for 6 months at the hospital which included heat modalities (therapeutic ultrasound and 34°C whirlpool), radiocarpal mobilization, stretching, controlled grip strength exercise, scapular retraction exercise, and electrical muscle stimulation in patients with atrophic intrinsic hand muscles suspected nerve injury. There might be occupational therapy program for kinetic activities with splint application. After 6 months of hospital-based program, a physiatrist reassessed the patient's outcome. If there was significant clinical improvement, the prescribed supervised physical and occupational therapy program was gradually titrated down and then ceased after improvement of hand and wrist function by capability to return to routine daily activities. The suggested home-based programs included hot pack, active assistive range of motion, self-stretching, and hand grip strengthening.

Outcome Measurements

Data included sex, age, injured side, severity of fracture, treatment methods, duration from fracture to rehabilitation, and rehabilitation treatment methods.

The primary outcome was calculated using modified scoring system for functional assessment (Table 1 in Supplement) at the period of 6 and 12 months which consisted of pain and functional scores, wrist and forearm range of motion, hand grip strength (kilograms), and deformity by radiological score.[12]

The criteria of good-outcome range of motion of wrist and forearm used in the study depended on 2 parts. First part comprised functional ranges of motion of the joints which were 45° of wrist extension, 30° of wrist flexion, and 50° of both forearm pronation and supination. Second part was derived from the comparison with the other side. The loss of angle less than 30° compared with the other side was considered good. The grip strength was measured by the hand dynamometer which applied with side-to-side comparison and reported in kilogram(s). The grip strength of the dominant side should be more than that of the nondominant side up to 15%. Less than 30% loss was considered as good grip strength. The deformity modified by Sarmiento radiological score[12] (Table 2 in Supplement) assessed at 6 and 12 months after fracture was categorized into good (no deformity) and poor (slight and obvious deformities) with 5, 2, and 0 score(s), respectively. (Table 3 in Supplement).

The secondary outcome was related factors which were statistically calculated and compared with the primary outcome. The outcome consisted of fracture severity (Fernandez classification by medical record or

imaging review by expert in case of no data recorded [type I-II, mild; type III-V, severe]), treatment method (surgery or conservative treatments), duration from fracture to the arrival at hand clinic (within or more than 2 months after fracture determined by remodeling phase of bone healing stage which usually occurs at 2 months after fracture), and rehabilitation setting (hospital or home based).

Statistical Analysis

STATA program version 16. (StataCorp. Version 16. College Station, TX: StataCorp LLC; 2019) was applied for demographic data and clinical characteristics of patients which were summarised in terms of means and proportions (percent). The Fisher exact test was used to compare characteristic based on assumption of the distribution of samples in this study. A *P* value of less than .05 was considered as statistical significance.

Results

Patients' average age was 63 years. There were 3 males and 27 females. The severity of the fracture was classified by Fernandez classification. Fourteen patients (46.7%) had type I-II (mild) severity while 16 (53.3%) had type III-V (severe) severity. According to the duration from injury to rehabilitation, 17 patients (56.7%) received the rehabilitation treatment after the fracture onset within 2 months. Thirteen (43.3%) were consulted after 2 months. Classifying by treatment methods, 14 patients (46.7%) received conservative treatment. Sixteen (53.3%) were corrected by surgical procedure. Three patients which were included in our study had the complications of non-union and mal-union after treatment but maintained well functions in daily activities by a year after fracture (Table 1).

Table 1. Patients Characteristics

Characteristic	No. (%)
Gender	
Male	3 (10.0)
Female	27 (90.0)
Age, mean (SD), y	63 (10.9)
Severity	
Mild (Fernandez type I-II)	14 (46.7)
Severe (Fernandez type III-V)	16 (53.3)
Duration from distal radius fracture to rehabilitation, mo	
≤ 2	17 (56.7)
> 2	13 (43.3)
Treatment methods	
Nonsurgical	14 (46.7)
Surgical	16 (53.3)
Rehabilitation setting	
Hospital-based	21 (70.0)
Home-based	9 (30.0)

Abbreviation: SD, standard deviation.

At 6 months after fracture, 7 patients had good outcome while the other 7 were fair. Sixteen patients appeared to have poor outcome. Focusing on the result at 12 months after fracture, 15 patients turned good, 9 patients turned fair, and the other 6 turned to have poor outcome.

Out of 14 patients with good and fair outcome, 13 patients (91.9%) were reported to have mild severity of distal radius fracture whereas 15 patients (93.8%) out of 16 patients with poor outcome had severe type of the fracture.

Reassessment of the score at 12 months revealed 24 patients had fair to good outcome, but only 6 still retained poor outcome. In the severe group, 5 out of 16 were found with poor outcome as compared with the previous result in 15 of 16 patients at 6 months after fracture.

Six months after the fracture, 9 patients (64.3%) who received conservative treatment reported good to fair outcome but five (35.7%) had poor outcome. Five patients (31.3%) received surgical procedure had good to fair outcome whereas 11 (68.7%) came up with poor outcome. At 12-month follow-up, most patients in both surgical and conservative groups reported much better outcome.

Seven patients (41.2%) receiving rehabilitation treatment within 2 months after fracture onset showed good to fair outcome by 6 months. Seven patients (53.8%)

who got the treatment after 2 months were found to have good to fair outcome. Considering treatment outcome at 12 months after fracture, 14 patients (82.4%) transferred earlier for rehabilitation treatment showed good to fair outcome. Ten patients (76.9%) transferred later than 2 months for treatment also had good to fair outcome.

Regarding the rehabilitation setting by 6 months after the fracture, 10 patients (47.6%) who acquired physical therapy program at the hospital showed good to fair outcome. Four patients (44.4%) with home program had satisfied outcome, but 5 patients (55.6%) had poor outcome. At 12 months after fracture, 18 patients (85.7%) on the hospital setting were found good to fair outcome whereas 6 patients (66.7%) on home program had satisfied outcome (Table 2).

There were 16 out of 30 patients (53.3%) found with poor outcome at 6 months after fracture. Focusing on each part of the total score in the poor-outcome group, we used our score details in each factor which was classified into good and poor outcome (Table 3 in Supplement). Twelve (75.0%) had good scores of wrist and forearm motions. All of poor group recovered from pain. Seven (43.8%) were found with less deformity. Only 1 patient (6.3%) had good hand grip strength. However, number of patients with good grip strength in the poor group increased from 1 to 12 (75.0%) at 1 year after fracture (Table 3).

The follow-up period of each patient with distal radius fracture in our hand clinic was set between 6 to 10 weeks by 1 year after the injury onset.

Table 2. Comparison of Related Potential Factors to Treatment Outcome

Related Factors	6 Months After Fracture			12 Months After Fracture		
	Good + Fair	Poor	*P* Value*	Good + Fair	Poor	*P* Value*
Duration from distal radius fracture to rehabilitation						
≤ 2months group	7 (41.2)	10 (58.8)	.49	14 (82.4)	3 (17.6)	.53
> 2 months group	7 (53.8)	6 (46.2)		10 (76.9)	3 (23.1)	
Fracture severity type						
Mild	13 (91.9)	1 (9.1)	< .001	13 (92.9)	1 (7.1)	.17
Severe	1 (6.2)	15 (93.8)		11 (68.8)	5 (31.2)	
Treatment method						
Nonsurgical	9 (64.3)	5 (35.7)	.07	12 (75.0)	4 (25.0)	.65
Surgical	5 (31.3)	11 (68.7)		12 (91.3)	2 (8.7)	
Rehabilitation setting						
Hospital-based	10 (47.6)	11 (55.4)	1.00	18 (85.7)	3 (14.3)	.32
Home-based	4 (44.4)	5 (55.6)		6 (66.7)	3 (33.3)	

* The Fisher exact test was used to compare characteristic based on assumption of the distribution of samples in this study, *P* value less than .05 was considered as statistical significance.

Table 3. Outcome in Each Factor of Poor Outcome Group at 6 and 12 Months After Fracture Onset

Outcome	Good/All (%)	
	6 Months After Fracture	12 Months After Fracture
Pain/Function	16/16 (100.0)	16/16 (100.0)
Range of motion	12/16 (75.0)	16/16 (100.0)
Grip strength	1/16 (6.3)	12/16 (75.0)
Deformity	7/16 (43.8)	13/16 (81.3)

Discussion

Distal radius fracture is commonly found and affects hand and arm use in daily-life activities. The longer life span is, the higher incidence rate of the fracture is. It is expected to be found up to 50% in 2030. Therefore, acknowledgement of the treatment outcome, including potential factors, is crucial in order to develop treatment guideline for better quality of life of those patients. According to our study, most patients were female with an average age of 63 years. Such problem can largely be found in this population.

The treatment outcome in patients with mild fracture was considered good at 6 months after the fracture. Those with severe type would change with good outcome at 12 months after fracture which was in accordance with the previous studies.[13-15] From these studies, we implied that patients with distal radius fracture who received rehabilitation treatment would have good outcome at 12 months after fracture. We suggested to follow them up every few months for at least 12 months, and particularly, those with severe fracture with complications required more frequency of intensive rehabilitation.

Focusing on the score in each part, we found that lower hand grip strength at 6 months after fracture worsened total score. The study of Quadlbauer et al[16] found that hand grip strength and range of motion of wrist and forearm became good at the period of 6 months after fracture. Kasapinova et al[17] found that only the grip strength was a significant pain and disability predictor at 3 and 6 months after injury. However, the previous studies of grip strength recovery in patients with distal radius fracture resembled our result. Bobos et al[18] concluded that there were clinically important differences in grip strength between the injured and uninjured hands in patients with distal radius fracture at 3 and 6 months after fracture. At 12 and 24 months after fracture, the differences were small and of uncertain clinical importance. Other studies reported ongoing recovery of grip strength occurred up to 1 year.[19, 20] Porter et al[21] also reported that grip function was closed to normal after 6 months of fracture onset. Despite poor grip strength at 6 months after fracture, our study also found all patients recovered from pain and had good hand function. We noticed that most patients in our study aged more than 60 years. Thus, elderly people may not required stronger grip strength in their daily activities.

Twenty-five of 30 patients had good wrist and forearm range of motion at 6 months after fracture. The number increased to 30 of 30 at 1 year after fracture while 22 of 30 patients improved their grip strength at the time. We could imply that patients with distal radius fracture received rehabilitation treatment would improve wrist and hand motion at 6 months after fracture. However, grip strength would likely to be good at 1 year after fracture.

Batra et al[11] found that surgical correction brought about efficient use of hand and wrist as compared with conservative group. In contrast, Cai et al[7] reported that elderly patients could be treated conservatively even in the context of an unstable fracture pattern. The previous systematic review and meta-analysis conducted by Ju et al,[22] also concluded that both surgical and conservative methods produced the similar results in the treatment of distal radius fracture in elderly. Both studies were in accordance with our study which showed that patients receiving conservative treatment (9 of 14) tended to have good outcome compared to those receiving surgery (5 of 16) at 6 months after fracture, but without statistical significance.

Dias et al[23] compared the outcome of treatment by duration from the injury to rehabilitation. They found that patients with earlier rehabilitation treatment had better outcome. In contrast, our study noticed that there was no difference in treatment outcome between the 2 groups of patients (earlier and later than 2 months).

Krischak et al[24] and Valdes et al[25] reported that home exercise program are an effective alternative to prescribed physical therapy treatment at hospital setting. They also concluded that hospital-based therapy may be preferable for patients with noteworthy complications after distal radius fracture. The result in our study also determined no clinical difference in both settings, but without statistical significance.

Valdes et al[25] reported that elderly, being female, and severe type of distal radius fracture contributed to poorer outcome which compatible with the result in our study.

Non-union and mal-union complications are not uncommonly found in severely injured patients with conservative treatment.[26, 27] Our study reported 3 patients (2 with non-union and 1 with mal-union). Two non-union patients were treated by surgery while one with mal-union was treated by conservative treatment. However, the total modified scoring system for functional assessment score of 3 patients was considered good (> 80) by 1 year after the fracture and they could use their hand and wrist well at that time.

We suggested that patients with severe distal radius fracture to be transferred for rehabilitation treatment for better outcome. Patients should also be monitored closely and prescribed a hand grip strengthening program because the strength reduced significantly in the first 6 months after fracture in our study.

The advantage of our study was the assessment with objective outcome by modified scoring system for functional assessment which mainly derived from the physical examination. It was different from other assessment methods which were scored subjectively by patients. Most patients in our study could present in follow-up appointment. However, the scoring system has never been studied for the validation and reliability. The future study is suggested.

This study comprised several confounding factors to be collected such as surgical technique, pain medication use, and occurrence of nerve injury.

Like many other retrospective studies, this study was limited by the scope of data that could only be retrieved from the medical record available. Some parts of which were missing and many parts of which were irrelevant to the study.

All of patients who received intensive rehabilitation only within our hand clinic in the period of 5 years as the maximal time limited by electronic medical record system were collected. Thus, the sample size might be too small to conduct multivariate analysis for data calculation. We suggested a further study with larger sample size for better statistical evaluation.

Conclusions

Most patients with distal radius fracture received rehabilitation treatment had good outcome in overall aspects at 6 months after fracture. However, grip strength would likely to be good after 12 months after fracture onset. Severe severity of distal radius fracture predicted poorer outcome compared with mild type with statistical significance. Patients receiving conservative treatment tended to have good outcome compared to those receiving surgery at 6 months after fracture, but without statistical significance. No statistically significant difference in treatment outcome was reported between patients received rehabilitation earlier and later than 2 months in accordance with rehabilitation settings.

Acknowledgments

The authors would like to acknowledge hand physical therapists and occupational therapists of Department of Rehabilitation Medicine, Ramathibodi Hospital for being important part of the team in treating patients.

References

1. Van Son MA, De Vries J, Roukema JA, Den Oudsten BL. Health status, health-related quality of life, and quality of life following ankle fractures: a systematic review. *Injury.* 2013; 44(11):1391-1402. doi:10.1016/j.injury.2013.02.018
2. Edwards BJ, Song J, Dunlop DD, Fink HA, Cauley JA. Functional decline after incident wrist fractures--study of osteoporotic fractures: prospective cohort study. *BMJ.* 2010;341:c3324. doi:10.1136/bmj.c3324
3. Cowie J, Anakwe R, McQueen M. Factors associated with one-year outcome after distal radial fracture treatment. *J Orthop Surg (Hong Kong).* 2015;23(1):

24-28. doi:10.1177/23094990150 2300106

4. van Leerdam RH, Huizing F, Termaat F, et al. Patient-reported outcomes after a distal radius fracture in adults: a 3-4 years follow-up. *Acta Orthop.* 2019; 90(2):129-134. doi:10.1080/ 17453674.2019.1568098
5. Jakim I, Pieterse HS, Sweet MB. External fixation for intra-articular fractures of the distal radius. *J Bone Joint Surg Br*. 1991;73(2): 302-306. doi:10.1302/0301-620X. 73B2.2005161
6. Lauder A, Agnew S, Bakri K, Allan CH, Hanel DP, Huang JI. Functional outcomes following bridge plate fixation for distal radius fractures. *J Hand Surg Am*. 2015;40(8):1554-1562. doi:10.1016/j.jhsa.2015.05.008
7. Cai L, Zhu S, Du S, et al. The relationship between radiographic parameters and clinical outcome of distal radius fractures in elderly patients. *Orthop Traumatol Surg Res.* 2015;101(7):827-831. doi:10.1016/j.otsr.2015.04.011
8. Michlovitz SL, LaStayo PC, Alzner S, Watson E. Distal radius fractures: therapy practice patterns. *J Hand Ther.* 2001; 14(4):249-257. doi:10.1016/ s0894-1130(01)80002-8
9. Waljee JF, Ladd A, MacDermid JC, Rozental TD, Wolfe SW; Distal Radius Outcomes Consortium. A unified approach to outcomes assessment for distal radius fractures. *J Hand Surg Am*. 2016;41(4):565-573. doi:10.1016/ j.jhsa.2016.02.001
10. Changulani M, Okonkwo U, Keswani T, Kalairajah Y. Outcome evaluation measures for wrist and hand: which one to choose? *Int Orthop.* 2008;32(1): 1-6. doi:10.1007/s00264-007-0368-z
11. Batra S, Gupta A. The effect of fracture-related factors on the functional outcome at 1 year in distal radius fractures. *Injury*. 2002;33(6):499-502. doi:10.1016/ s0020-1383(01)00174-7
12. Sarmiento A, Pratt GW, Berry NC, Sinclair WF. Colles' fractures. Functional bracing in supination. *J Bone Joint Surg Am.* 1975;57(3): 311-317.
13. Grewal R, MacDermid JC, Pope J, Chesworth BM. Baseline predictors of pain and disability one year following extra-articular distal radius fractures. *Hand (N Y).* 2007;2(3):104-111. doi:10.1007/ s11552-007-9030-x
14. Brogren E, Hofer M, Petranek M, Dahlin LB, Atroshi I. Fractures of the distal radius in women aged 50 to 75 years: natural course of patient-reported outcome, wrist motion and grip strength between 1 year and 2-4 years after fracture. *J Hand Surg Eur Vol*. 2011;36(7): 568-576. doi:10.1177/1753193411 409317
15. Landgren M, Abramo A, Geijer M, Kopylov P, Tägil M. Similar 1-year subjective outcome after a distal radius fracture during the 10-year-period 2003-2012. *Acta Orthop.* 2017;88(4):451-456. doi:10.1080/ 17453674.2017.1303601
16. Quadlbauer S, Pezzei C, Jurkowitsch J, et al. Early rehabilitation of distal radius fractures stabilized by volar locking plate: a prospective randomized pilot study. *J Wrist Surg*. 2017;6(2):102-112. doi:10.1055/s-0036-1587317
17. Kasapinova K, Kamiloski V. Outcome evaluation in patients with distal radius fracture. *Prilozi*. 2011;32(2):231-246.
18. Bobos P, Nazari G, Lalone EA, Grewal R, MacDermid JC. Recovery of grip strength and hand dexterity after distal radius fracture: a two-year prospective cohort study. *Hand Ther*. 2018; 23(1):28-37. doi:10.1177/1758 998317731436
19. Lagerström C, Nordgren B, Rahme H. Recovery of isometric grip strength after Colles' fracture: a prospective two-year study. *Scand J Rehabil Med.* 1999;31(1): 55-62. doi:10.1080/003655099 444731
20. Dillingham C, Horodyski M, Struk AM, Wright T. Rate of improvement following volar plate open reduction and internal fixation of distal radius fractures. *Adv Orthop.* 2011;2011:565642. doi:10.4061/2011/565642
21. Porter S. Occupational performance and grip function following distal radius fracture:

a longitudinal study over a six-month period. *Hand Ther*. 2013;18(4):118-128. doi:10.1177/1758998313512280

22. Ju JH, Jin GZ, Li GX, Hu HY, Hou RX. Comparison of treatment outcomes between nonsurgical and surgical treatment of distal radius fracture in elderly: a systematic review and meta-analysis. *Langenbecks Arch Surg.* 2015; 400(7):767-779. doi:10.1007/s00423-015-1324-9
23. Dias JJ, Wray CC, Jones JM, Gregg PJ. The value of early mobilisation in the treatment of Colles' fractures. *J Bone Joint Surg Br*. 1987;69(3):463-467. doi:10.1302/0301-620X.69B3.3584203
24. Krischak GD, Krasteva A, Schneider F, Gulkin D, Gebhard F, Kramer M. Physiotherapy after volar plating of wrist fractures is effective using a home exercise program. *Arch Phys Med Rehabil.* 2009;90(4):537-544. doi:10.1016/j.apmr.2008.09.575
25. Valdes K, Naughton N, Burke CJ. Therapist-supervised hand therapy versus home therapy with therapist instruction following distal radius fracture. *J Hand Surg Am.* 2015; 40(6):1110-1116.e1. doi:10.1016/j.jhsa.2015.01.036
26. Sanders RA, Keppel FL, Waldrop JI. External fixation of distal radial fractures: results and complications. *J Hand Surg Am.* 1991;16(3):385-391. doi:10.1016/0363-5023(91)90002-s
27. Wilson K, von der Heyde R, Sparks M, et al. The impact of demographic factors and comorbidities on distal radius fracture outcomes. *Hand (N Y).* 2014;9(1):80-86. doi:10.1007/s11552-013-9559-9

Supplement

Table 1. Modified Scoring System for Functional Assessment[11]

Outcome	Result	Total Score*
Pain/Function	Non/normal	50
	Mild occasional/slight limitation	40
	Moderate/need analgesics/some limitation	25
	Severe/weak with loss	0
Mobility	Normal	25
	Less than 30%	20
	Minimal function**	10
	Less than minimal	0
Deformity	None	5
	Slight	2
	Obvious	0
Grip strength	Normal	20
	15% loss	15
	16% - 30% loss	10
	More than 30% loss	0

* Total score: Good > 80-100; Fair 70-80; Poor < 70

** Dorsiflexion 45°, Palmar flexion 30°, Pronation/supination 50°

Table 2. Sarmiento Radiological Score (Modified Lindstrom Criteria)[12]

Outcome	Residual Deformity	Loss of Palmar Tilt (°)	Radial Shortening (mm)	Loss of Radial Deviation (°)
Excellent	Insignificant	0	< 3	< 5
Good	Slight	1 - 10	3 - 6	5 - 9
Fair	Moderate	11 - 14	7 - 11	10 - 14
Poor	Severe	> 14	> 11	> 14

* Average radial deviation of 23°

Table 3. The Score Detail in Each Factor of Our Study

Outcome	Good	Poor
Pain/Function	- Non/normal - Mild occasional/slight limitation	- Moderate/need analgesics/some limitation - Severe/weak with loss
ROM	- Normal - Less than 30% - Minimal function (wrist extension 45°, flexion 30°, forearm pronation/supination 50°)	- Less than minimal
Grip strength	- Normal - 15% loss - 16% - 30% loss	- More than 30% loss
Deformity*	- None or Excellent	- Slight or Good&Fair - Obvious or Poor

* Use Sarmiento radiological score (modified Lindstrom criteria) (See Table 2 in Supplement)

RMJ Ramathibodi Medical Journal

Rama Med J | Original Article

ผลการรักษาและปัจจัยที่มีผลในผู้ป่วยที่มีกระดูกแขนส่วนปลายหักภายหลังได้รับการฟื้นฟู

เตชิต จิระวิชิตชัย[1], ธีรุตม์ พรทวีทรัพย์[1], มลรัชฐา ภาณุวรรณากร[1]

[1] ภาควิชาเวชศาสตร์ฟื้นฟู คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล กรุงเทพฯ ประเทศไทย

บทนำ: ภาวะกระดูกแขนส่วนปลายหักพบได้บ่อยในผู้ป่วยสูงอายุ การฟื้นฟูและกายภาพบำบัดสามารถช่วยเพิ่มประสิทธิภาพในการรักษา โดยลดอาการปวด เพิ่มมุม และความแข็งแรงของการกำมือได้

วัตถุประสงค์: เพื่อศึกษาผลการรักษาและปัจจัยที่มีผลในผู้ป่วยที่มีกระดูกแขนส่วนปลายหักภายหลังได้รับการฟื้นฟู

วิธีการศึกษา: การศึกษาย้อนหลังจากข้อมูลเวชระเบียนผู้ป่วยที่ได้รับการวินิจฉัยกระดูกแขนส่วนปลายหักและส่งมารับการรักษาทางเวชศาสตร์ฟื้นฟูต่อเนื่องอย่างน้อย 12 เดือน รวม 30 คน ผลการรักษาหลัก ประกอบด้วย ระดับความปวด การใช้งานของมือ มุมการเคลื่อนไหวของข้อมือและปลายแขน แรงบีบกำมือ และการผิดรูป ถูกนำมาคำนวณเป็นคะแนน Modified scoring system for functional assessment ผลการรักษารอง หรือปัจจัยที่มีผลต่อการรักษาคือ ความรุนแรงของภาวะกระดูกหัก วิธีการรักษา ระยะเวลาตั้งแต่กระดูกหักจนมาพบแพทย์เวชศาสตร์ฟื้นฟู และสถานที่ฟื้นฟู ถูกนำมาคำนวณวิเคราะห์ความสัมพันธ์ทางสถิติเทียบกับผลการรักษาหลัก

ผลการศึกษา: ผู้ป่วยมีผลการรักษาส่วนใหญ่ดีขึ้นที่ 6 เดือนหลังกระดูกหัก มีเพียงแรงบีบกำมือที่ต้องใช้เวลาประมาณ 1 ปี ผู้ที่มีภาวะกระดูกแขนส่วนปลายหักชนิดรุนแรงมากให้ผลการรักษาที่ไม่ดี จำนวน 15 คน จาก 16 คน (ร้อยละ 93.8; $P < .001$) ผลคะแนนโดยรวมดีขึ้นชัดเจนในช่วง 1 ปี หลังกระดูกหัก ปัจจัยที่เกี่ยวข้องอื่นๆ ไม่มีผลต่อการรักษาอย่างมีนัยสำคัญ ($P > .05$)

สรุป: ผู้ป่วยมีผลการรักษาโดยรวมอยู่ในระดับดีที่ระยะเวลา 12 เดือนหลังกระดูกหัก ภาวะกระดูกหักที่รุนแรงมีผลเสียต่อผลการรักษาอย่างมีนัยสำคัญ วิธีการรักษา ระยะเวลาในการส่งมาแผนกฟื้นฟู และสถานที่ฟื้นฟูไม่มีผลต่อการรักษาอย่างมีนัยสำคัญ

คำสำคัญ: กระดูกแขนส่วนปลายหัก เวชศาสตร์ฟื้นฟู การใช้งานมือ

Rama Med J: doi:10.33165/rmj.2022.45.1.254019

Received: October 20, 2021 **Revised:** March 15, 2022 **Accepted:** March 24, 2022

Corresponding Author:
เตชิต จิระวิชิตชัย
ภาควิชาเวชศาสตร์ฟื้นฟู
คณะแพทยศาสตร์
โรงพยาบาลรามาธิบดี
มหาวิทยาลัยมหิดล
270 ถนนพระรามที่ 6
แขวงทุ่งพญาไท เขตราชเทวี
กรุงเทพฯ 10400 ประเทศไทย
โทรศัพท์ +66 2201 1154
โทรสาร +66 2201 2228
อีเมล tachit.jir@mahidol.ac.th