International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Original Research Article

Efficacy of Passive Mobilization and Home Exercises in Post Immobilization Period of Distal Radius Fracture

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Received: 19/12/2016 *Revised: 03/01/2017* *Accepted: 06/01/2017*

ABSTRACT

Background and objective: To compare the efficacy of passive mobilization and home exercises with only home exercises in post immobilization period of distal radius fracture.
Methods: Thirty subjects in post immobilization period of distal radius fractures participated in the study. These subjects were randomly allocated to experimental and control groups. All the subjects were evaluated for pain, grip strength, ROM and functional capabilities before the treatment started ('0' day) and at the end of 2nd week. Both the groups received Paraffin Wax Bath and home exercises in common. However the experimental group received an additional intervention in the form of passive mobilization. Outcomes were measured for pain, grip strength, ROM and functional capabilities.
Results: Statistical analysis showed significant gain in pain reduction, grip strength, ROM and functional capabilities (in "0" day- 2nd week period) in experimental group than control group.
Interpretation and Conclusion: Combination of passive mobilization and home exercises is more effective than home exercises alone in post immobilization period of distal radius fractures.
Key words: Post immobilization, Distal radius fractures, Paraffin wax bath, Home exercises, Passive mobilization.

INTRODUCTION

Fractures of the distal radius account for around 16% of all fractures which are seen in trauma and emergency ward and represent 74.5% of all fractures of the forearm bones. [(1)]

Previously these fractures were considered to be the problems of elderly group with women getting affected more than men but now due to high energy trauma even younger adults are also becoming more prevalent.

In past distal radius fractures were considered as a homogenous group of injuries with good or excellent prognosis regardless of treatment applied. [(2)] Recently clinicians have noted that these fractures can be complex injuries with a variable prognosis depending on the nature of the fracture pattern. Despite their frequency, the extent of anatomic disruption, associated soft tissue injuries, and eventual outcome has been difficult to assess and predict. [(3)] An excellent result is more likely when the bony anatomy has been properly restored [(4)] which can be achieved either by closed reduction and immobilization in a cast or with percutaneous pins or external fixation [(5)] or even open reduction internal fixation.

In post immobilization period patients generally complain of pain, swelling, muscle weakness, inability to move the part freely and there by decreased functional capabilities. Therapist after detail

evaluation aims at decreasing pain and swelling, increasing muscle strength, regaining range of motion and ultimately reincorporation of the part into the activities and thereby enabling them back to their work, by improvising functional outcomes.
The philosophy of treatment is to provide advice and education to ensure protection of the fracture and control of swelling, warming the joint and soft tissue, treatment techniques designed to reduce stiffness and to increase muscle strength. Exercises in the form of active and passive movements are given as home program while passive mobilization by the therapist can be performed in the clinic.

As per review of literature, studies state that home exercises are one of the effective methods of treatment in post immobilization period of distal radius fractures. For the effects of passive mobilization there are contrasting reports, as some studies mention that passive mobilization is an effective method, while others state that passive mobilization will not add any beneficial effects. [(6-10)]
Therefore there was a need for a study to understand, evaluate and compare whether passive mobilization when added with home exercises will add any effect than home exercises alone for outcome measures in the treatment of post immobilization period of distal radius fractures.

METHODOLOGY

A prospective interventional study was carried out in S.D.M. College of Medical Sciences and Hospital, Dharwad. Ethical clearance was obtained from the Ethical Committee of S.D.M. College of Medical Sciences and Hospital, Dharwad, prior to the study. Subjects following distal radius fractures of either gender in immediate post immobilization period were included for the study from Physiotherapy Out Patient Department (OPD) of the hospital. Any subject with either history of previous fracture around the wrist on the affected side or any infective or inflammatory wrist joint condition or any neurological problems affecting the same upper limb or reflex sympathetic dystrophy or any simultaneous associated injuries in the same limb were excluded from the study.

Subjects who fulfilled the criteria were explained in detail about the study in their own language and a written consent was taken. Each subject was evaluated subjectively and objectively for pain, range of motion of wrist and radio- ulnar joints, grip strength and functional capabilities on "0" day (before the treatment started) and at the end of 2nd week. The assessment tools used for principal parameters were Visual Analog Scale (VAS) for pain at rest, Universal Goniometer for range of motion of flexion, extension, radial deviation, ulnar deviation, supination and pronation in degrees, portable Hand Dynamometer for grip strength in Kilograms, and functional assessment were measured on a Functional Assessment Tool. [(10)]

A group of 30 (thirty) subjects were taken for the study and were randomly allocated by lottery system into two groups; group 'A': Experimental group (N=15) and group 'B': Control group (N=15). Subjects were advised for protecting the fracture site and to control swelling. Subjects in group 'A' were given paraffin wax bath then passive mobilization (distraction, Maitland's passive joint mobilization and passive physiological movements by the therapist) in the OPD. They were also advised to perform a set of exercises as home program in the morning as well as in evening, whereas subjects in group 'B' were advised for paraffin wax bath and the same set of exercises as home program in the morning and evening at home. Subjects in both groups A & B received paraffin wax bath once a day. They were provided with a compliance sheet on which they put a tick mark (√) every time they did exercises. Then at the end of 2nd week they were reassessed for the readings of the same four parameters.

PROCEDURE

For passive mobilization they were made to sit erect with full thigh support on a chair with back and arm rests. A pillow was placed over the subject's lap and the part was supported over it. Therapist sat on an adjustable height stool opposite to the subject facing each other. The joint on work was placed in its loose packed position or near to it. Keeping pain factor in mind initially, 1) distraction of radiocarpal and midcarpal joints were given, 2) then 8- 10 repetitions of Maitland's grade I or II mobilization for inferior radioulnar, radiocarpal, intercarpal, first, fourth, fifth carpometacarpal and intermetacarpal joints, 3) followed by three repetitions of slow passive physiological movements starting from neutral position and till it touched the pain (flexion, extension, radial deviation, ulnar deviation, pronation and supination)were given. Similarly 2nd and 3rd sets were given. Rest time of one minute was added in between the sets.

RESULTS

Table 1: Demographic data of Control and Experimental groups.

Group	Sex	Number	Mean Age (In years)	S D
"A" (Experimental)	M	6	46.60	13.47
	F	9		
"B" (Control)	M	5	45.4	12.68
	F	10		

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Table 2: Comparison of groups A & B with respect to different variables at 0 day & 2 weeks.

GROUP	VARIABLES	0 DAY (MEAN)	SD	2 WEEKS (MEAN)	SD	MEAN DIFF.	PAIRED t-VALUE	p - VALUE	SIGNI.
A (Experimental)	PAIN (VAS){¥}	6.13	0.83	0.80	0.77	5.30	19.74	0.00	S
	GRIP STRENGTH (KG){€}	0.93	0.59	3.47	0.64	-2.53	-19.00	0.00	S
	COMBINED ROM (DEGREES){‡}	37.8	17.5	211	31.0	-173	-25.6	0.00	S
	FUNCTIONAL CAPABILITIES{Θ}	1.60	1.18	9.60	2.44	-8.00	-10.95	0.00	S
B (Control)	PAIN (VAS){¥}	6.53	0.83	3.07	0.80	3.47	18.07	0.00	S
	GRIP STRENGTH (KG){€}	0.80	0.77	2.73	0.80	-1.93	-16.36	0.00	S
	COMBINED ROM (DEGREES){‡}	31.3	22.1	118	33.4	-86.7	-17.7	0.00	S
	FUNCTIONAL CAPABILITIES{Θ}	2.07	1.44	7.00	1.69	-4.93	-12.10	0.00	S

Table 3: Comparison of groups A & B with respect to gain scores of different variables.

VARIABLES	Group A		Group B		t-value	p-value	Signi.
	Mean	S D	Mean	S D			
PAIN{¥}	-5.30	1.05	-3.46	0.74	-5.63	0.00	S
GRIP STRENGTH{€}	2.53	0.52	1.93	0.46	3.37	0.00	S
COMBINED ROM{‡}	173	26.2	86.7	19.4	10.3	0.00	S
FUNCTIONAL CAPABILITIES{Θ}	8.00	2.83	4.93	1.58	3.67	0.00	S

DISCUSSION

The results were analyzed using parametric tests and analysis showed that combination of home exercises and passive mobilization was more effective in management of post immobilization period of distal radius fractures than home exercises alone in 0-2 weeks.

Table I gives the demographic data of the subjects participated in the study.

Table 2 {¥} shows there is significant decrease on VAS scores for pain in both the groups A & B which can be attributed to the application of heat [paraffin wax bath]. An increase in temperature leads to a state of analgesia and sedation in the injured area by acting on free nerve endings. Nerve fibers are stimulated, blocking the transmission of pain with a counter irritant effect. [(11)] Heat reduces muscle spasm by decreasing the sensitivity of the muscle's secondary afferents which decreases muscle tone and alleviates pressure on the nerve. [(12)] Increasing blood flow and reducing local muscle metabolites further alleviates spasm. [(13)]

Table 2 {€}shows there is significant increase in the grip strength scores (in Kilograms) in both the groups A & B. Subjects of both groups A & B apart from receiving heat, also performed set of exercises as home program, which included both isometrics and dynamic resistive exercises. Decreased fluid viscosity and increased nerve conduction velocity due to heat, increases muscle function and strength. [(14)] Active exercises results in an increase in the recruitment of motor units in the muscle and hypertrophy of muscle fibers. [(15)] So, we can say the effects of heat and exercises together are responsible for significant improvement of grip strength in both groups A & B.

Table 2 {‡} shows that there is significant increase in ROM (in degrees) in groups A & B respectively, which can be due to relief of pain & muscle spasm, strengthening of the weakened muscles and stretching of the tightened soft tissues.

Table 2 {Ɵ} shows that there is significant increase in functional capabilities scores in both groups A and B, which can be attributed to significant decrease in pain, significant increase in grip strength and ROM.

Table 3 {¥} shows that there is significant gain in pain reduction in-group A as compared to group B in 0-2weeks period. This signifies that adding passive mobilization techniques to the treatment was responsible for additional significant pain relief in-group A. Grades I and II oscillations are primarily used for treating joints limited by pain. The oscillations may have an inhibitory effect on perception of painful stimuli by repetitively stimulating mechanoreceptors that block nociceptive pathways at the spinal cord or brain stem levels. [(16)] These non-stretch motion help move synovial fluid to improve nutrition to the cartilage. Keeping pain as the main factor in initial stage, grades I & II of mobilization were given to group A where no tissue resistance was encountered so they did not "mobilize" to increase range but they reduced pain and induced relaxation through mechanoreceptor mechanism. Small amplitude distraction or gliding movements of the joint are used to cause synovial fluid motion, which is the vehicle for bringing nutrients to the avascular portions of the articular cartilage (and intra-articular fibrocartilage when present).. [(15)]

Table 3{€} shows that there is significant gain in grip strength (in Kilograms) in-group A as compared to group B. Group A where passive mobilization techniques were added in the treatment protocol which resulted in significant decrease in pain and relief of muscle guarding (spasm). This possibly would have allowed subjects to perform the exercises more freely and efficiently, which resulted in significant increase in grip strength in-group 'A' as compared to group 'B'.

Table 3 {‡} shows that there is significant gain in ROM in group A as compared to group B which can be due to significant decrease in pain (by grade I & II mobilization effect) and increase in muscle strength.

Table 3{Ɵ} shows that there is significant gain in functional capabilities scores in-group A as compared to group B. As a result of gain in all other three parameters due to addition of passive mobilization, there was significant gain in functional capabilities scores in-group A as compared to group B.

CONCLUSION

In this study both groups A & B showed significant improvements but passive mobilization with exercises were an effective intervention than exercises alone in post immobilization period of distal radius fractures on 0 day - 2ndweek.

Further studies can be performed on a larger sample size with importance for uniform age group and nature of fracture pattern. Also in this study pain at rest was considered, so giving more importance to the functional activities pain during movements can be considered.

Progressively vigorous joint play stretching techniques (grade III &IV) are primarily used to elongate tight capsule, shorten ligaments and thereby to correct reversible joint hypomobility. In this study pain factor was kept in mind therefore grade I & II mobilization was used. So once post immobilization painful phase is over grades III & IV mobilization should be indicated, which can also be further scope for the study.

ACKNOWLEDGMENT

I acknowledge all the subjects who participated in this study.
Financial support: self
Conflict of interest: nil

REFERENCES

1. N Nagi, M S Dhillon, S. Aggarwal, K J Deogaonkar: External fixators for intra articular distal radius fractures, Indian Journal of Orthopedics, January 2004, Vol- 38, No-1, 19-22.
2. Abraham Colle's: The classic: on the fracture of the carpal extremity of the radius. Edinburgh Med Surg J. Clin Orthop 1972, 83:3-5.
3. Gartland JJ, Werley CW: Evaluation of healed Colle's fractures. J Bone Joint Surg Am 1951, 33:895-907.
4. Altissimi M, Antenucci R, Fiacca C, Mancini GB: Long term results of conservative treatment fractures of distal radius. Clin Orthop 1986; 206: 202-210.
5. Fernandez DL, Geissler WB: Treatment of displaced articular fractures of the radius. J Hand Surg 1991; 16A: 375-384.
6. Millet, P. J. & Rushton, N. "Early Mobilization In The Treatment Of Colles' Fracture: A 3 Year Prospective Study"; Injury1995; 26: 671-675.
7. Coyle, J.A. & Robertson,V. J. "Comparison Of Two Passive Mobilization Techniques Following Colles' Fracture; A Multi-element Design"; Manual therapy 1998;3: 34-41.
8. Taylor, N.F. & Bennell, K.L. "The Effectiveness Of Passive Joint Mobilization On The Return Of Active Wrist Extension Following Colles' Fracture – A Clinical Trial". New Zealand Journal of Physiotherapy 1994; April: 24-28
9. McPhate, M. & Robertson, V.J. "Passive Mobilization In The Physiotherapy Treatment Of Colles' Fracture" Conference Proceedings: Manipulative Physiotherapist Association Meeting 1997. Nov 26-29 Melbourne, Australia.
10. Kay, S.; Haensel, N.; & Stiller, K. "The effect of passive mobilization following fractures involving the distal radius: a randomized study" Australian Journal of Physiotherapy; 2000; vol-46; Page 93-101.
11. Eldred, E, et al: The effect of cooling on mammalian muscle spindles. Exp Neurol, 1960, 2:144.
12. Fischer, E and Solomon, S: Physiological response to heat and cold. In Licht, S (ed): Therapeutic heat and cold, ed 2. Waverly Press, Baltimore, 1965, P 126.
13. Weinberger, A and Lev A: Temperature elevation of connective tissue by physical modalities. Crit Rev Phys Rehabil Med :1991: 3: 121.
14. Lehmann, JF and De Lateur, BJ: Therapeutic heat. In Lehmann, JF(ed): Therapeutic heat and cold, ed 4. Williams & Wilkins, Baltimore, 1990, P. 417.
15. C. Kisner, L. A. Colby: Therapeutic Exercise Foundations and Techniques, 4th edition, Philadelphia, F. A. Davis Company: 1996, Pg-221.
16. Paris, SV: Mobilization of the spine, Phys Ther: 1979 Aug; 59(8): 988-95.

How to cite this article: Lal RK, Bhat K, Sanjay P. Efficacy of passive mobilization and home exercises in post immobilization period of distal radius fracture. Int J Health Sci Res. 2017; 7(2):189-193.

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