



## EFFECT OF RESISTED EXERCISES AND AQUATIC EXERCISES IN POST TRAUMATIC WRIST STIFFNESS.

**Shruti Kothavale \***

Intern, Krishna College of Physiotherapy, KIMS 'Deemed to be' University, Karad, Maharashtra, India. \*Corresponding Author

**Dr. Namrata Patil**

Assistant Professor, Department of Paediatrics, Krishna College of Physiotherapy, KIMS 'Deemed to be' University, Karad, Maharashtra, India.

### ABSTRACT

**Background:** The purpose of this study was to assess the effectiveness of resisted exercises and aquatic exercises in post traumatic wrist stiffness.

**Method:** 30 subjects of post traumatic wrist stiffness were included in this study. Following the data collection, the subjects were allotted into 2 groups, Group A – Conventional treatment along with aquatic exercises and Group B – Conventional treatment along with resisted exercises. Before and After the treatment protocol subjects were assessed by Goniometer for range of motion and PRWE Scale, these outcome measures were analysed.

**Result:** Pre and Post treatment protocol was analysed using paired t test and unpaired t test. Analysis for range of motion ( $p = <0.0001$ ), PRWE ( $p = <0.0001$ ).

**Conclusion:** Aquatic therapy with conventional therapy i.e. (paraffin wax bath and mobilization) enhances the range of motion of wrist and reduces pain and increases the strength and movement and activity of wrist.

**KEYWORDS :** Aquatic exercises, post traumatic wrist stiffness, resisted exercises.

### Introduction

Wrist is the ellipsoid type of joint. It plays an important role in functional activity of daily living. Movement performed by wrist are flexion, extension, radial deviation, ulnar deviation and circumduction<sup>1</sup>. Stiffness mainly occur after any trauma or injury to any part of body, which may lead to stiffness. Stiffness may be caused by extrinsic factors or intrinsic factors. Any trauma to the body, disturbs the collagen matrix of capsule of joint which increases the inflammatory cytokine level, which leads to stiffness<sup>3,4</sup>.

In resisted exercise, external force is applied to the wrist or part to be treated. This resisted exercises increases the tension in the muscles, which increases the strength and power of the muscle, tension in muscle is increased due to isotonic contraction which occur due to force of resistance<sup>5</sup>.

In aquatic exercises, water facilitates and initiate the range of motion and provides a resistance to the wrist. It also creates a weight bearing exercises to the joint which enhances the movement. When the part is immersed, buoyancy of water act like a resistance to the joint which create the decrease of weight bearing effect on joint and water buoyancy also decreases the stress on joint<sup>6,8,9,10,11,12</sup>.

### MATERIALS AND METHODOLOGY

Post traumatic wrist stiffness patients or subject were taken, who were willing to participate. They were taken into study, depending upon inclusion and exclusion criteria. Inclusion criteria include: both male and female who were willing to participate, age must be between 20 – 50 years, subject must be diagnosed with post traumatic wrist stiffness. Exclusion criteria include: vascular deficit, neurological impairment, infective skin condition, hypersensitive skin.

30 subjects (13 males, 17 female), mean age Group A= 31.266, mean age Group B= 32.133, participated in the study. Subject were divided into 2 groups through random sampling method. In group A, 15 subject were participated in which they received aquatic exercises and conventional treatment i.e. paraffin wax bath and mobilization. In Group B 15 subjects were participated in which they received resisted exercises and conventional treatment. All the subjects were informed about the protocol and risk of study and gave written consent form before the participation and treatment. The protocol and the consent form were previously approved by protocol and ethical committee.

### Measurement Procedure:

#### ROM assessment of wrist –

The ROM is recorded in active flexion, extension, radial deviation, ulnar deviation with standard goniometer. All movements of wrist joint were recorded while subjects were in sitting position and forearm were supported on table or on the plinth. Wrist was on the edge of table or plinth to measure the ROM.

#### Patient rated wrist evaluation (PRWE) –

PRWE scale describes the pain and difficulty while performing the activity of wrist.

PRWE is divided into two major factors, 1. Pain, 2. Function.

Function is further divided into two parts: 1. Specific function, 2. Usual function.

### Therapeutic protocol

**Both groups (A and B) received conventional treatment as following:**

**- Paraffin wax bath:** Paraffin wax bath is applied to the wrist, thick layer is applied to wrist with brush and was wrapped with the towel, to maintain its warmth. So it will create a proper baseline treatment for mobilization, resisted exercises and aquatic exercises.

**Mobilization:** Mobilization was given grade wise to the wrist. 30 repetition of mobilization of wrist were given in 1 session. 3 sessions were given per day. Dorsal and Volar glide were given to increase flexion and extension of wrist in post traumatic stiffness. Grade wise mobilization were given so the joint integrity and available joint range of motion will be maintained.

**Aquatic Exercises:** In aquatic exercises, patients wrist is immersed in water, for free movement to increase the range of motion and strength of wrist. Forearm is supported and wrist is on the edge of table or plinth, and immersed in water.

**Resisted exercises:** In resisted exercises, force or resistance is applied to the patients wrist depending upon the intensity of pain, while performing flexion or extension, resistance is applied.

### STATISTICAL ANALYSIS

The data was entered into Microsoft Excel 2016. The data was

analysed using instant software. Descriptive statistics were used to analyse baseline data for demographic data. Pre and Post treatment protocol was analysed using paired t test and unpaired t test.

**Results:**

30 subjects meeting the inclusive criteria were included in the study. During 4 week of protocol, 15 subject (6 males and 9 female) were in group A, aquatic exercises with conventional treatment i.e. paraffin wax bath and mobilization and other 15 subjects (7 males and 8 female) were in group B, resisted exercises with paraffin wax bath and mobilization were given. The descriptive analysis of the study is summarized in table 1. Intra group in table 2. Inter group in table 3.

**Table 1. Descriptive characteristics of subject in study.**

| VARIABLES       | GROUP A | GROUP B |
|-----------------|---------|---------|
| Age (mean ±SD)  | 31.266  | 32.133  |
| No. of subjects | 15      | 15      |
| No. of Males    | 6       | 7       |
| No. of Females  | 9       | 8       |

**Table 2. Intra group analysis comparing pre and post of each group**

| GROUP A (AQUATIC EXERCISES ) |                  | PRE (mean ± SD) | POST (mean ± SD) | P value | T value |
|------------------------------|------------------|-----------------|------------------|---------|---------|
| ROM                          | FLEXION          | 7.733±3.327     | 65.4±7.258       | <0.0001 | 45.365  |
|                              | EXTENSION        | 9.4±2.473       | 60.466±8.202     | <0.0001 | 25.339  |
|                              | RADIAL DEVIATION | 1.733±1.792     | 11.54±1.820      | <0.0001 | 20.472  |
|                              | ULNAR DEVIATION  | 2.6±2.473       | 25.553±6.248     | <0.0001 | 17.579  |
| PRWE                         |                  | 53.666±6.419    | 6.8±5.260        | <0.0001 | 32.781  |

| GROUP B (RESISTED EXERCISES ) |                  | PRE (mean ± SD) | POST (mean ± SD) | P value | T value |
|-------------------------------|------------------|-----------------|------------------|---------|---------|
| ROM                           | FLEXION          | 5.466±2.446     | 44.5±6.56        | <0.0001 | 24.101  |
|                               | EXTENSION        | 6.4±3.680       | 48±5.292         | <0.0001 | 46.566  |
|                               | RADIAL DEVIATION | 1.733±1.624     | 9.766±1.425      | <0.0001 | 18.129  |
|                               | ULNAR DEVIATION  | 4.933±3.453     | 21.933±4.234     | <0.0001 | 27.205  |
| PRWE                          |                  | 56.9±7.834      | 13.166±5.678     | <0.0001 | 36.204  |

Intra group statistical analysis revealed extremely significant difference (p = <0.0001) between pre and post intervention for all the groups using paired t test. Result show the improvement in range of motion of wrist.

**Table 3. Inter group analysis comparing pre and post of each group**

|     |                  |      | GROUP A      | GROUP B      | P value | T value |
|-----|------------------|------|--------------|--------------|---------|---------|
| ROM | Flexion          | Pre  | 7.733±3.327  | 5.466±2.446  | 0.0424  | 2.126   |
|     |                  | Post | 65.4±7.258   | 44.8±6.560   | <0.0001 | 8.155   |
|     | Extension        | Pre  | 9.4±2.473    | 6.4±3.680    | 0.0140  | 2.621   |
|     |                  | Post | 60.466±8.202 | 48±5.292     | <0.0001 | 4.947   |
|     | Radial Deviation | Pre  | 1.733±1.792  | 1.733±1.624  | >0.9999 | 0.000   |
|     |                  | Post | 11.54±1.820  | 9.766±1.425  | 0.0060  | 2.971   |
|     | Ulnar Deviation  | Pre  | 2.6±2.473    | 4.933±3.453  | 0.423   | 2.128   |
|     |                  | Post | 25.553±6.248 | 21.933±4.234 | 0.0738  | 1.858   |
|     | PRWE             | Pre  | 53.666±6.419 | 36.9±7.834   | 0.2265  | 1.236   |
|     |                  | Post | 68±5.260     | 13.166±5.678 | 0.0035  | 3.186   |

**DISCUSSION**

Reviewing various studies, it was analysed that conservative management and rehabilitation were the routine guidelines for treating subjects with post traumatic wrist stiffness patients. This

study was undertaken considering all the mentioned points and the sole aim of this study was to evaluate the effect of resisted exercises and aquatic exercises in post traumatic wrist stiffness. In studies, there is decrease in muscle activation during aquatic exercises.

Stiffness is the common problem after trauma, which causes impairment of limbs. Because of high degree of congruence complexity of joint surface and sensitivity lead towards trauma, which causes stiffness<sup>23</sup>. Aquatic therapy was started in 1920's, which shown that, there is improvement in neuromuscular function who have injury. Buoyancy is the main content in water which decreases stress on joint and muscle<sup>6,8,10</sup>.

Total 30 subjects, who were diagnosed with post traumatic wrist stiffness, fulling the inclusive and exclusive criteria were taken in the study.30 subjects were divide into 2 groups (group A and group B). Among which, 13 were males, and 17 were females. Pre and Post assessment were measured using Range of motion and PRE scale. In Group A, Aquatic exercises and in Group B resisted exercises were given, both the groups received baseline treatment of paraffin wax bath and mobilization. Treatment period was 4 weeks i.e. 5 days in 1 week.

Goniometer to measure range of motion and PRWE scale were also used to measure intensity of pain and movement or any difficulty of wrist. In this study, aquatic exercises are more effective than resisted exercises in post traumatic wrist stiffness. Flexion and Extension are extremely significant, radial deviation and ulnar deviation more improvement

**REFERENCES**

1. B D Chaurasia's Human Anatomy, Regional and Applied Dissection and Clinical, Upper Limband Thorax, Volume 1 Pg. no 153 – 156.
2. Odhr'an Murray, Duncan Macdonald Et. Al, Management of the post traumatic stiff elbow, Department of Trauma and Orthopaedics, Glasgow Royal Infirmary, Glasgow, UK ©2011 British Elbow and Shoulder Society Shoulder and Elbow 2012.
3. Guang Yang, Evan P. McGlenn, Kevin C. Chung, Management of the Stiff Finger: Evidence and Outcomes, Published in final edited form as: Clin Plast Surg. 2014 July;41(3):501–512. doi:10.1016/j.cps.2014.03.011.
4. D. S.Ruch, J. Shen, G. D. Chloros, E. Krings, A. Papadonikolakis , Release of the medial collateral ligament to improve flexion in post-traumatic elbow stiffness , The Journal of Bone And Joint Surgery, ©2008 British Editorial Society of Bone and Joint Surgery doi:10.1302/0301-620X.90B5.19999.
5. M. Dena Gardiner, The Principles Of Exercise Therapy, 4th Edition Pg no 41, 49 – 59, 136.
6. Bryan T. Kelly, Lori A. Roskin, Donald T. Kirkendall, Kevin P. Speer, Shoulder Muscle Activation During Aquatic and Dry Land Exercises in non-impaired subjects , Journal of Orthopaedic & Sports Physical Therapy 2000;30 (4):204-210.
7. Paul M.Weeks, R.Chris Wray, Et.Al, The Result of Non – Operative management of stiff joints in the hand, vol61, no 1.
8. Umit Dundar, Ozlem Solak, Et.Al, Clinical Effectiveness of Aquatic Exercise to Treat Chronic Low Back Pain, A Randomized Controlled Trial, SPINE Volume 34, Number 14, ©2009, Lippincott Williams & Wilkins.
9. Eunkuk Kim\* and Hokyung Choi, Aquatic Physical Therapy in the Rehabilitation of Athletic Injuries: A Systematic Review of the Literatures, Kim and Choi, JYoga Physical Therapy 2014;5:3.
10. Carolyn Kisser , Lynn Allen Colby , Therapeutic Exercises Foundations And Techniques, 6th Edition, Pg.no 290 – 298.