

A study on the effectiveness of paraffin wax bath therapy and intrinsic muscle exercises in reducing pain and increasing precision gripping movements of rheumatoid hand

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Abstract:

Introduction: The prevalence of RA increases with age in both sexes and is most common in elderly group. Women are mostly affected than men. It is a worldwide problem affecting nearly all population. It occurs in both rural and urban areas in all climates. The course of disease is invariable and unpredictable.

Purpose: It is a common condition accounting for a large percentage of people. The result of this study will help the physiotherapist to offer a better treatment to provide the patients having RA hand and also a better rehabilitation to these patients.

Methodology: The study was pretest & posttest experimental design comparative in nature. The study was conducted for a period of 10 days. It includes Acute and sub-acute conditions of 10 patients with above 18 years of age. The patients are randomly selected those who fulfill the criteria of inclusion. VAS or numeric scales assess pain severity by asking the patient to indicate the present level of pain.

Results: According to VAS scale, the mean value of pre-test is 5.5 and posttest is 3.2 for 9 degrees of freedom and SD value with 0.674 with 0.005 level of significance 3.250, the calculated 't' value is 10.776, which is greater than the table value. According to pinch-o-meter measurement the mean value of pre-test is 3.7 and posttest is 3.4 for 9 degrees of freedom and at 0.005 level significance, the table value is 3.250 the calculated 't' value is 6.9 which is greater than the table value.

Keywords: Paraffin Wax, Intrinsic Muscle Exercises, Pain, Precision Gripping, Rheumatoid Hand.

I. INTRODUCTION

Rheumatoid arthritis is a heterogeneous, chronic inflammatory and non-supportive arthropathy of unknown cause that affects most of the joints. [1] The term arthritis includes both inflammatory and degenerative lesions of the joint. The onset of progression varies from mild joint symptoms to abrupt swelling; stiffness and progressive deformity [2]. Joints are characteristically involved with early changes in the synovial membrane, peripheral portions of the articular cartilage and subchondral marrow spaces [3]. Granulation tissue form restriction in joint mobility, fibrosis may eventually result causing deformity the prevalence of RA increases with age in both sexes and is most common in elderly group [4]. Women are mostly affected than men. It is a worldwide problem affecting nearly all population. It occurs in both rural and urban areas in all climates [5]. The course of disease is invariable and unpredictable. The most commonly affected joints are ankle and foot complex, knee complex, hip complex, spinal joints, shoulder joint, elbow joint, wrist & hand complex [6]. The more painful areas are the wrist & hand complex and the ankle & foot complex. Ankle and foot complex are responsible for weight bearing and ambulation process [7]. When compared to the ankle and foot complex, wrist and hand complex involves more of functional movements in the ADL and consists of gripping activities which needs most of coordination, good muscle power, joint mobility & flexibility, orientation, consciousness and must be devoid of contractures & deformity [8, 9, 10].

1.I Precision Grip

The positions and muscle requirements of precision handling are somewhat more variable than those that of power grip, require much of finer motor control, and are more dependent on intact sensation [11,12]. The thumb serves as one 'jaw' of what has been termed a 'two-jaw chuck'; the thumb is generally adducted and rotated from the palm. The second and opposing jaw is formed by the distal tip, the pad, or the side of finger. When two fingers oppose the thumb, it is called a three-jaw chuck [13]. The three varieties of precision handling that exemplify this mode of precision are PAD-TO-PAD precision, TIP-TO-TIP precision and PAD-TO-SIDE precision. Each tend to be a dynamic function

with relatively little static holding. Pad to pad involves opposition of the pad, or pulp, of the finger. Thumb in pad-to-pad precision is held in CMC flexion, abduction and rotation. The first MP and IP joints may be partially flexed or fully extended [14]. The main muscles involving in this grip are thenar muscle, flexor digitorum profundus and flexor digitorum superficialis. In tip-to-tip precision, IP joints of the finger and the thumb must have the range and available muscle force to create full joint flexion [15,16]. In the first finger, the ulnar deviation occurs as MP joint adduction. Tip-to-tip precision has all the same musculature as for the pad-to-pad [17]. However, activity of the FDP, FPL, and interossei muscle works [18]. It is also known as key grip because a key is held between the pads of the index finger [19]. It differs from the other forms of precision handling only in that the thumb is more adducted and less rotated [20]. The activity level of the FPB muscle increases and that of OP decreases, in comparison with tip-to-tip precision [21]. The precision grip is used in day-to-day activities like writing, combing, holding the materials (utensils, books, paper, key etc.) in hand, typing, eating, etc. [22].

1.II Methodologies

The statistical tool used in the study is paired 't' test.

Research Design: Pre-test, Post-test, Experimental study design.

Sampling Technique: Randomized sampling. **Sample Size:** 10 subjects

Duration of Study: All subjects who fulfilled the criteria were taken as the population of this study which includes 10 patients and given the same treatment individually for ten days.

Study Setting: The project carried out in "RVS Educational Trust and R.V.S Hospital Campus", Sullur, Coimbatore.

$$\bar{d} = \frac{\sum d_i}{n}$$
$$s_d = \frac{\sum |d_i - \bar{d}|}{\sqrt{n}}$$

d – Difference between pre-test and post-test values

\bar{d} – Mean difference

n – Total number of subjects

SD – Standard deviation

t – Paired t test

LI. Measurement Tools

1) VAS (Visual Analogue Scale)

2) PINCH-O-METER

Visual Analogue Scale (VAS)

It is a valid and reliable tool used to measure the pain. It is very useful pain assessment tool; it is simple, sensitive, and reproducible instrument that allows patient to express the severity of pain.



Fig – I (Pain scale)

“0” Indicates no pain, and “10” indicates maximum or severe pain. The patient is asked how much pain, they feel and to mark on the scale. Accordingly the readings were taken during the treatment session. The patient was tested both before and after the treatment sessions to find the prognosis of the treatment session.

Pinch-O-Meter

Pinch-O-Meters designed to measure the finger strength of individuals with grasping disabilities. It is a precision instrument for measuring the force of precision. Black pointer indicates applied force in pounds and kilograms. Red pointer remains at maximum reading achieved. Calibration accuracy: 1% of full scale. This device is suitable for all pinch tests (tip, key, and palmar) and registers up to 50 pounds. The strength reading can be viewed as pounds or kilograms.

Measurement Procedure

The subjects were chosen randomly, they were checked for the contraindications as varicose veins, DVT, arterial diseases, infections or open wounds, gross edema with delicate skin covering, deep X-ray therapy, liniments if used that may cause hypersensitivity to heat.

Then the subjects were assessed by measuring tools Visual Analogue Scale and Pinch-O-Meter before and after the treatment session

1) Vas Scale:

The subjects were individually given a 10 cm long scale measuring from 0 to 10 and were asked to mark their perception of pain and it was recorded.

2) Pinch-O-Meter:

The subjects were individually given an instrument and asked to hold in the hand to be tested with arm at right angles and elbow by the side of the body. The patient is asked to hold the instrument in-between the pulp of index and thumb and press it with maximum isometric effort for about 2 to 5 seconds.

No other body movement is allowed. The subject should strongly encourage giving maximum effort. The values were recorded in kilograms. After the completion of Pre-test, the patient is given wax bath therapy for reducing pain and exercises for improving grip movements of RA hand

Treatment Procedure

Wax Bath Therapy:

Paraffin wax has been used for many years. It is an effective medium for heat transfer to the skin and joints. The use of warm paraffin wax on the hands has a very soothing and therapeutic effect. The warm paraffin wax applied to the skin makes the blood vessels expand and therefore helps the circulation, bringing healing nutrients to the surface and flushing toxins out of the skin. Check the temperature of the paraffin wax. It should be between 40°- 44°c on the thermometer. Sometimes this may be inaccurate and hence to test the wax temperature, dip a finger and show to the subject as a demonstration.

Instruct the subject to wash and thoroughly dry the hands to be treated. If the subject is wearing any jewelry, make them to remove it and keep it safe. Then the subject is made to sit with arm in the lap. Dip a towel or bandage in the hot wax and then wrapped around both the hands for 15 to 20 minutes. Wax leaves the skin moist, soft and pliable. Once the treatment is given by paraffin wax, it can be reused for the next session.

As the wax solidifies from its molten state it releases its energy of latent heat and its heat energy is conducted into the tissues.

With a very short period of rest the subject was given the following strengthening program.

Exercise Therapy:

The following exercises were given as follows

- Flexor gliding exercise
- Finger curls
- Open wide hand exercise
- Fingertip touch
- Rubber band exercises
- Towel exercises

After giving wax bath therapy and intrinsic muscle exercises, the subjects were post-tested by the measuring tool following the same procedure as for the pre-test.

II. RESULTS

10 subjects with RA hand were taken pre-test on Pain (VAS scale) and Precision Grip (Pinch-O-Meter).After 10 days of treatment with wax bath therapy and intrinsic muscle exercises, post-test was taken. According to VAS scale, the mean value of pre-test is 5.5 and post test is 3.2 for 9 degrees of freedom and SD value with 0.674 with 0.005 level of significance 3.250, the calculated ‘t’ value is 10.776, which is greater than the table value. According to pinch-o-meter measurement the mean value of pre-test is 3.7 and post test is 3.4 for 9 degrees of freedom and at 0.005 level significance, the table value is 3.250 the calculated ‘t’ value is 6.9 which is greater than the table value. Hence the subjects showed significant reduction of pain and improvement in precision grip of RA hand.

Table-1 Shows the average strength of pulp pinch with separate digits.

Digits	Male Hand		Female Hand	
	Major	Minor	Major	Minor
II	5.3	4.8	3.6	3.3
III	5.6	5	3.8	3.4
IV	3.8	3.6	2.5	2.3
V	2.3	2.2	1.7	1.6

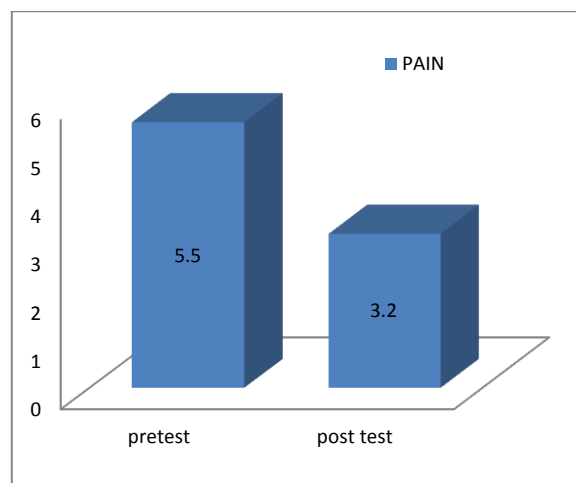
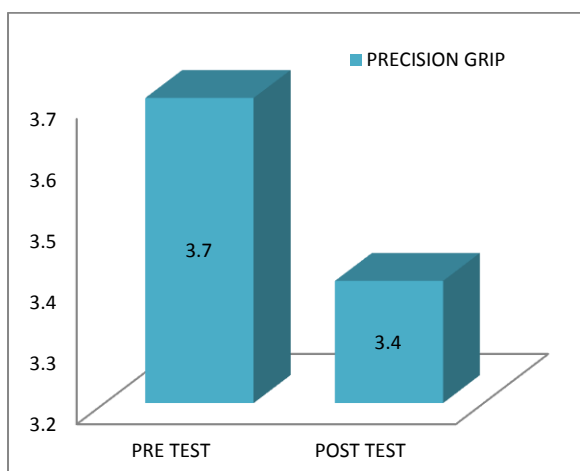


Fig I shows the graphical representation of pre-test and post-test values for pain.

Table-2 shows the comparison of pre-test and post-test values for pain.

	Mean	SD	't' value	Level of Significance
Pretest	5.5			
Post test	3.2	0.674	*10.776	p≤0.005

**Fig II. shows the graphical representation of pre-test and post-test values for precision grip.****Table-III shows the comparison of pre-test and post-test values of precision grip.**

	Mean	SD	't' value	Level of Significance
Pretest	3.7			
Post test	3.4	0.265	*6.9	p≤0.005

III. DISCUSSION

According to Dellhag.B, Wollers JO, wax bath therapy followed by active hand exercises resulted in significant improvement in ROM and grip function According to Brighton SW, Lubbe JE, long term exercise program on rheumatoid hand, gives a significant improvement in precision grip strength According to Flint-Wager HG, Lisse J, Lohman TG, et al(2009), they did an assessment of a 16-week training program on strength, pain, and function with wax bath therapy and intrinsic muscle exercises on patients having, RA now show a good result in increasing hand grip strength, and a marked reduction of pain. Based on the above mentioned studies, this study supports in reducing pain and improving precision grip strength for patients suffering from rheumatoid arthritis

IV. CONCLUSION

The study was conducted for the period of 10 days by randomized selection of 10 subjects affected rheumatoid arthritis involving hand. The visual analog scale and the pinch-o-meter were the materials used to assess pain and precision grip. During the treatment period wax bath therapy and intrinsic muscle exercises were given. The calculated 't' value is greater than the 't' table value for both pain and precision grip values. According to the result and discussion, the study has been concluded that the wax bath therapy and intrinsic muscle exercise is an effective way of reducing pain and improving the precision grip of the subjects with RA hand Hence the alternative hypothesis suggests that there is a significant difference in the efficacy of paraffin wax bath therapy and strengthening exercises in reducing pain and improving precision grip.

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