



Effectiveness Of Paraffin Wax Bath Along with Mulligan Mobilization on Pain and Functional Activities in Subjects with Colles Fracture After the Removal of Cast -A Simple Experimental Study

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ABSTRACT

Background Of the Study: Fracture of the lower or distal end of the radius within 1 inch of the distal articular surface of the radius; incidence rates for men and women over 35 years of age were 9/10,000 and 37/10,000, respectively.

Objectives: The main objective of the study was to determine how well subjects with colles fractures responded to various therapeutic interventions, such as mulligan mobilizations and paraffin wax baths.

Subjects And Methods: Simple experimental research with pre- and post-tests was conducted. Fifteen patients with a diagnosis of colles fracture were selected by a convenient sample technique based on predetermined criteria. Throughout eight weeks, a single group had mulligan mobilization and a paraffin wax bath. A VAS scale, a Quick DASH questionnaire, and a Goniometer were used to assess how effective the therapy was. Treatment efficacy was investigated using the paired t-test. A p-value of less than 0.05 was regarded as significant.

Result: In the quick DASH questionnaire, the group that received paraffin wax bath and mulligan mobilization treatment demonstrated improved functional activities, decreased pain (pre- and post-test mean differences 5.1 and 2.1), and increased range of motion (pre- and post-test mean differences for wrist flexion 26 & 49, wrist extension 29.5 and 48.5) as measured by the goniometer. Consequently, the mulligan mobilization and paraffin wax bath at 0.05 significance level.

Conclusion: After eight weeks of mulligan mobilization and paraffin wax bath, patients with colles fractures report much less discomfort and an improvement in their functional activities.

Clinical Implications: A paraffin wax bath & mulligan mobilization have a major impact on the management of patients with colles fracture.

Keywords: Colles fracture, paraffin wax bath, mulligan mobilization, VAS scale, quick DASH questionnaire, Goniometer.

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1. Introduction

"COLLE'S FRACTURE" refers to a fracture of the distal or lower tip of the radius that occurs less than an inch from the radius's distal articular surface. Since the corticocancellous junction in the bone is where these fractures occur, the bone nearly always unites. This kind of fracture is most

frequently observed in middle-aged and older adults, especially in women, who have fallen on an outstretched hand with their wrists flexed.¹ The distal fragment in a displaced kind of Colle's fracture is slanted dorsally, resulting in a common deformity known as "DINNER FORK DEFORMITY" in the hand and wrist. Supination of the distal fragment, radial deviation, and proximal impaction are the additional displacements.¹

1.1 Mechanism of injury: The cause of it is a fall onto an extended hand with the wrist extended, with the thenar eminence bearing the majority of the stress. There is a fracture at the lower end of the radius that rotated into supination at the ulnar styloid process's center of impaction. The triangular fibrocartilage complex (TFCC) gets injured and the ulnar styloid process is avulsed if the stress is applied indefinitely. People in their middle and later years are more likely to suffer from a Colle's fracture. There is a bimodal distribution of distal radial fracture in young athletes who have high energy injuries from sports and car crashes.²

The probability of fracture increases with age in low energy trauma patients who also have osteoporosis. This risk is higher in women, who are more likely to have osteoporosis. Due to insufficient bone mineralization, fractures frequently occur in young people around puberty. Following the patient's referral by the surgeon, physical therapy for a Colles fracture can begin. Variety of techniques and therapies to assist to manage pain.³ These might consist of TENS, ICE, or HEAT. I employ Mulligan mobilization and paraffin wax in my intervention to enhance functional activities since early mobilization promotes effective rehabilitation.⁴

1.2 ETIOLOGY: Most often, a Colles fracture occurs when a person falls onto an extended hand. Trauma from incidents like auto, bicycle, or ski accidents can also cause it to happen. A person's age may have an impact on whether they sustain a Colles fracture. For instance, trauma-related high-intensity breakdowns are more likely in individuals between the ages of 18 and 25 than in older adults.⁵ However, because their bones might be more fragile, older persons are more likely to have falls or trips. Osteoporosis in elderly women is also associated with these kinds of breakdowns. This disorder weakens the bones and usually manifests itself later in life.⁶

A person may be unaware of their fragile bones until they break.⁷ People over 60 who suffer from Colles fractures typically do so after falling from a standing posture. Colles fractures can be limited, but not entirely prevented, by those who are susceptible to them, such as elderly individuals with osteoporosis or individuals who have balance issues. SYMPTOMS: Wrist pain when flexing, swelling, sensitivity, bruising, obvious deformity-DINNER FORK DEFORMITY.

1.3 DIAGNOSIS: RADIOLOGICAL FEATURES: It's critical to distinguish Colle's fracture from other fractures that might occur at the same the spot, including Barton fracture at the distal radius and Smith's fracture. Anteroposterior and lateral wrist radiographs are crucial for determining the fracture's displacements.⁸ Radiographs taken laterally and anteriorly, reveal the following displacements: Dorsal displacements, dorsal tilt, Lateral displacements, lateral tilt impaction. Any

intra-articular involvement in the colle's fracture can be seen on an oblique radiograph.⁹

1.4 COMPLICATIONS: The most frequent consequence is stiffness in the fingers and wrists, which is brought on by the inability to move the finger joints when immobilized. Malunion: This is the next most common problem that arises from partial displacement correction during operations.¹ Carpal tunnel syndrome, delayed extensor tendon rupture caused by attrition by the rough dorsal surface of the fracture line, and dinner fork deformity are all possible outcomes of malunion. Sudeck osteodystrophy: This uncommon consequence is marked by extreme discomfort, edema, swelling, and circulation problems in the hand, which cause pain and stiffness in all of the hand joints. The main contributory factor of reflex sympathetic osteodystrophy in the upper limb is a colles fracture. Carpal tunnel syndrome: The healed callus compresses the median nerve in the carpal tunnel. It results in tingling and numbness in the hand's median nerve supply region.¹⁰ The patient may occasionally report experiencing discomfort and numbness. Splinting, the delivery of steroids, and in certain situations, decompression are all part of the treatment.¹¹

DRUG (distal radio-ulnar joint) subluxation: The DRUJ subluxes as a result of the radius being shortened by impaction of the radius fracture.¹² The forearm and wrist movements start to hurt. There are cases where the lower end of the ulna is excised.

1.5 TREATMENT: CONSERVATIVE MANAGEMENT: A cast below the elbow is used as a conservative treatment for the majority of distal radial fractures. Stabilization in a cast below the elbow is required for 4-6 weeks in case the fracture is displaced.

SURGICAL MANAGEMENT: If the fracture is displaced, immobilization with a cast below the elbow for four to six weeks and closed manipulative reduction under general anesthesia are required. External fixator: A buttress plate or specialized plates are used in open reduction internal fixation (ORIF) for fractures that are noticeably displaced.¹³

1.5.1 Paraffin wax therapy - A type of deep heating treatment called paraffin wax therapy uses paraffin oil & wax primarily to relieve pain in the hands, feet, and aching joints and muscles.¹⁴

1.5.2 Mulligan technique - Mobilization with movement is the concurrent application of sustained accessory mobilization applied by the therapist and active physiological movement to end range applied by the patient.¹⁵ Despite the use of different procedures, mal-alignment as well as deformity occur in the majority of instances following the removal of the cast in cases of colles fracture. Therefore, the purpose of this study is to ascertain if paraffin wax and mulligan mobilization are beneficial in treating colles fractures after the cast is removed.¹⁶

2. METHODOLOGY:

2.1 Study Design: A pre – test and post- test simple experimental study was used with single group to assess the effectiveness of Paraffin wax therapy along with mulligan mobilization on pain and functional activities in subjects with colles fracture after the removal of cast.¹⁷

2.2 Subjects: The population for this study consisted of all the patients who visited the outpatient department of PPG College of Physiotherapy, Coimbatore, complaining of pain and reduced functional activities.¹⁹ Among them, a criterion-based selection technique was used to select the patients (N=15) who had been diagnosed with colles fractures. Prior to selection, a physician checked each subject to rule out a distal radius fracture that was dorsally displaced after the cast was removed. The patients' ages ranged from 40 to 60 years old (depending on the epidemiology), and they were both male and female. Pain scores up to 3 on the VAS; distal radius closed fracture.¹⁸

The following criteria were chosen: osteopenia, open wounds, infections, heterotrophic ossification, and a pain level of at least four on the VAS.²⁰

2.3 Methods: Prior to implementing the intended treatment activities, a purposive sampling strategy was used to create a single group of 15 individuals, after consent from them was obtained. Prior to the use of specific treatment procedures, all participants (N = 15) were identical ($p>0.05$). Both mulligan mobilization and paraffin wax treatment were administered to the participants in the single group.²¹ All treatment intervention lasted for eight weeks. The Quick Dash questionnaire outcome parameter and Visual Analog Scale were selected in order to examine the efficacy of the treatment measures.²²

2.4 Description of Experimental Intervention:

2.4.1 Paraffin Wax Therapy: This type of deep heating therapy mostly uses wax and paraffin oil to relieve pain in the hands, feet, and painful muscles and joints. Paraffin wax has an actual temperature of 42–52 degrees Celsius and a melting point of 51–54 degrees Celsius. The characteristics of wax physically are minimal heat conductivity, a large heat capacity, not soluble in water. By warming the connective tissues, it is one of the most efficient ways to use heat to relieve pain, enhance mobility, boost blood flow, and reduce stiffness.²³

Duration: 15 Minutes

2.4.2 Mulligan Mobilization:

In 1954, Brian R. Mulligan obtained his certificate in manipulative therapy and became a trained physiotherapist. The Mobilization with movement, as used in the Mulligan technique, refers to the patient's active physiological movement to end range combined with the therapist's sustained accessory mobilization. THE PILL responses: The therapist should seek for the PILL reaction while using MWMs as an evaluation tool so that they may use it as a therapy strategy.

- P – Pain-free
- I-Instant result
- LL-long lasting

2.4.3 Mulligan Mobilization with Movements:

2.4.3.1 Dorsal and Palmar Glide at Radiocarpal Joint: The patient is seated in the chair with his hand resting on the couch. The therapist stands next to the patient. The patient's elbow is stabilized at a ninety-degree flexion with the therapist's proximal hand. Just distal to the radial & ulnar styloid processes, the distal hand holds the radiocarpal joint. To facilitate wrist extension or flexion, the row of the carpal bones is moved dorsally during mobilization.

2.4.3.2 Ulnar and Radial Glide at Radio Carpal Joint: The patient is seated in a chair with his hand resting on the couch and his forearm in a mid-prone position. The therapist stands next to the patient. The wrist remains in the middle range position. The therapist's hand applies stress around the distal row of the carpal bones. Ulnar glide increases radial deviation, whereas radial glide increases the wrist joint's ulnar deviation.

2.4.4 Radial and Ulnar Glides At Thumb Metacarpal Carpal Joint: The patient is seated in the chair with his hand resting on the couch. The therapist is standing next to the patient. The therapist's hand should mobilize and hold the patient's first metacarpal while stabilizing the patient's hand distal forearm with a grip around the trapezium. Applying light traction, move the metacarpal in the direction of the radius to enhance extension or the ulna to improve flexion with the mobilizing hand.

2.4.5 Dorsal and Palmar Glides At Thumb Metacarpal – Carpal Joint: The patient is seated in the chair with his hand resting on the couch. The therapist stands next to the patient. Glide the metacarpal in the direction of the palm to improve adduction, then glide dorsally to induce abduction, using the mobilizing hand.

2.4.6 Dorsal or Palmar Glides At MCP/IP Joints: The patient is positioned with his forearm resting on the couch and is sitting. The therapist stands next to the patient. The patient's forearm must be supported by the therapist before they can grasp the proximal bone of the joint that has to be mobilized with one hand while holding the distal bone between the thumb and index finger of the mobilizing hand with the other. The mobilization induced by shifting the distal bone's base dorsal or palmar, hence encouraging flexion or extension, respectively.^{24,25}

2.5 STATISTICAL ANALYSIS:

A quick dash questionnaire and the Visual Analog Scale were used to assess the data. The results

of the pre- and post-tests were recorded. Following the treatment interventions, there is an increase ($p \leq 0.05$) in both the pre and post-test results.

3. Results

The group that received paraffin wax therapy in addition to mulligan mobilization demonstrated improved functional activities (pre and post-test mean differences of 13.6 and 27.6) in the Quick DASH questionnaire and a better reduction in pain (pre and post-test mean differences of 5.1 and 2.1) in the Visual Analog scale. Therefore, the mulligan mobilization and paraffin wax treatment at 0.05 levels of significance.^{26,27}

Table 1: Comparing the reduction in pain between the pre- and post-intervention phases for individuals with colles fractures in a single experimental group.

Dependent variable	Groups	Pre-intervention stage		Post- intervention stage		T-value
		Mean	SD	Mean	SD	
Pain	Single group	5.1	0.421	2.1	0.31	4.32

*Significance at 0.05 levels($p \leq 0.05$)

According to Table 1, the single group that received treatment combinations consisting of Mulligan mobilization and paraffin wax therapy had a greater decrease in pain (pre test mean 5.1 and post test mean 2.1) at 0.05 levels of significance.

Table 2: Comparing the pre-intervention and post-intervention functional activity improvements of individuals with colles fractures within a single experimental group.

Dependent variable	Groups	Pre-intervention stage		Post-intervention stage		T-value
		Mean	SD	Mean	SD	
Functional activities	Single group	13.6	1.13	27.6	2.56	2.40

*Significance at 0.05 levels($p \leq 0.05$)

Table 2 suggests that the single group receiving treatment combinations consisting of Mulligan mobilization and paraffin wax therapy improved more than the other group in terms of functional activities (before test mean 13.6, post-test mean 27.6) at 0.05 levels of significance.

4. Discussion

This study examined the impact of mulligan mobilization and paraffin wax therapy on pain and functional activities in participants who have had a colles fracture after the cast is removed.

"COLLE'S FRACTURE" refers to a fracture of the distal or lower end of the radius that occurs less than an inch from the radius's distal articular surface. Since the corticocancellous junction of the bone is where these fractures occur, the bone nearly always unites. This kind of fracture is most frequently observed in middle-aged and older adults, especially in women, who have fallen on an outstretched hand with their wrists bent. The distal fragment of a displaced kind of colle's fracture is slanted dorsally, resulting in a common deformity known as "DINNER FORK DEFORMITY" in the hand and wrist. Supination of distal fragment, radial deviation, and proximal impaction are the additional displacements.^{28,29}

4.1 Mechanism of injury: It happens when a person falls on an extended hand with their wrist extended, with their thenar eminence bearing the majority of the impact. There is a fracture at the lower end of the radius that rotated into supination at the ulnar styloid process center of impaction. The triangular fibrocartilage complex (TFCC) is wounded and the ulnar styloid process is avulsed if the stress is applied indefinitely. People in their middle and later years are more likely to suffer from a Colle's fracture. There is a bimodal distribution of distal radial fracture in young athletes who have high-energy injuries from sports and automobile accidents.

The risk of fracture increases with age in low-energy trauma patients who also have osteoporosis. This risk is higher in women, who are more likely to have osteoporosis. In Due to insufficient bone mineralization, fractures frequently occur in young people around puberty. Following the patient's referral by the surgeon, physical therapy for a colles fracture can begin. a range of methods and therapies to assist manage pain. These might consist of TENS, ICE, or HEAT. I employ mulligan mobilization and paraffin wax in my intervention to enhance functional activities since early mobilization promotes effective rehabilitation.

4.1.1 Etiology: Most often, a colles fracture occurs when a person falls onto an extended hand. Trauma from incidents like auto, bicycle, or ski accidents can also cause it to happen. A person's age may have an impact on whether they sustain a colles fracture. For instance, trauma-related high intensity breakdowns are more likely in individuals between the ages of 18 and 25 than in older adults. However, because their bones might be more fragile, older persons are more likely to have falls or trips. Osteoporosis in elderly women is also associated with these kinds of breakdowns. This disorder weakens the bones and usually manifests itself later in life. A person may be unaware of their fragile bones until they break. People over 60 who suffer from colles fractures typically do so after falling from a standing posture. Colles fractures can be limited, but not entirely prevented, by those who are susceptible to them, such as elderly individuals with osteoporosis or individuals who have balance issues.

4.1.2 Symptoms: Wrist pain when flexing, swelling, sensitivity, bruising, obvious deformity-DINNER FORK DEFORMITY.³⁰

4.2 Paraffin wax therapy - A type of deep heating treatment called paraffin wax therapy uses paraffin oil & wax primarily to relieve pain in the hands, feet, and aching joints and muscles.

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DURATION: 15 MINUTES

4.5 Mulligan Mobilization:

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- P – Pain free
- I-Instant result
- LL-long lasting

Therefore, the purpose of this study is to examine functional performance after eight weeks of mulligan mobilization and paraffin wax treatment. The primary goal of the research is to determine how mulligan mobilization and paraffin wax treatment affect individuals' pain and functional activities following cast removal for colles fractures.

Simple experimental research was the study's design. The subject was chosen through the use of purposive sampling. The study's participant age groups were 18 to 25 years old. There were fifteen male participants in this research. Fifteen people in total were recruited for this study based on the inclusion criteria.

The PPG College of Physical Therapy's ethics committee was fully informed of the purpose and need of the study. Following clearance, the study was carried out at the PPG Institute in Coimbatore.³²

Eight weeks of paraffin wax therapy combined with mulligan mobilization resulted in a considerable improvement in the performance of the patients with colles fractures.

The paired t test is one of the statistical methods employed in the data analysis. The statistical significance of the pre- and post-test results for patients with colles fractures is determined using the paired t test. Using the VAS and Quick DASH questionnaires, the statistical report demonstrates a substantial improvement in post-test values compared to pre-test values for pain and functional activities. At the 5% level of significance, the calculated t value for the tests listed above was higher than the table t value of 2.145 for degree of freedom (df-14).³³

As a result, the alternative hypothesis has been accepted and the null hypothesis was rejected. Additionally, this study implies that paraffin wax therapy and mulligan mobilization may be suggested for the improvement of functional capacity and pain reduction in people with lateral ankle sprains.

5. Limitations:

- The study period lasted less
- There is a very limited patient sample size in this study.
- The research just evaluated the patients' immediate improvement.

6. Further Direction of This Study:

- More research, maybe in the form of a long-term study, could strengthen the validity of the findings.
- Additional research and a routine follow-up program may be added to learn more about the treatment's long-term effects.
- More subjects can be included in future research. Longer treatment periods can be used for future research.

7. Conclusion:

The results of this study indicate that improving functional activities and reducing pain is achieved by combining a paraffin wax bath with mulligan mobilization with movement in the colles fracture following cast removal.

8. Conflict of interest

No potential conflict of interest was reported by the authors.

9. Acknowledgement

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