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Effect of myofascial release and active release technique in participants with acute lateral epicondylitis

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Abstract
Background: Lateral epicondylitis is the most common condition occurring at the elbow joint. It is a pathologic condition of the wrist extensor muscles at their origin on the lateral humeral epicondyle. ART and MFR with ultrasound are used as a mode of treatment in lateral epicondylitis.
Materials and methodology: The participants were divided into two groups each including 10 participants: A (MFR + Ultrasound) & B (ART + Ultrasound). NPRS, PRTEE questionnaire and hand dynamometer was used to evaluate the outcome measures at the beginning and end of 3 weeks. The period of intervention was 3 weeks for 4 days per week and after 3 weeks.
Result: Post intervention, MFR and ART with ultrasound were beneficial in reducing pain, improving functional abilities and grip strength.
Conclusion: Study concluded that MFR was more effective then ART when compared on Hand Dyanomometer and PRTEE Questionnaire, while on NPRS both were effective.

Keywords: ART, MFR, US, NPRS, PRTEE questionnaire and hand dynamometer

Introduction

The elbow joint is a hinge variety of synovial joint between the lower end of humerus and upper end of radius and ulna bones. Elbow joint is the term used for humeroradial and humeroulnar joint. The joint receives its blood supply from the anastomoses around the elbow joint and nerve supply is through ulnar nerve, median nerve, radial nerve, musculocutaneous nerve through its branch to brachialis. Following movements are carried out by elbow joint: flexion by brachialis biceps brachii, brachialis, and Extension by triceps brachii and anconeus [1]. Most common conditions around this joint is cubital tunnel syndrome, elbow arthritis, elbow dislocation, ulnar collateral ligament tear, distal biceps tendon rupture, elbow fracture, olecranon bursitis, osteochondritis dissecans, lateral epicondylitis. A population-based study was done by Robert P. Nirschl on "The epidemiology and health care burden of lateral epicondylitis": of a general population of 144,000. Over a period of 13 years, 5,867 persons were identified with lateral epicondylitis, an overall incidence rate of 4.5 per 1,000 in the year 2000 reducing to 2.4 per 1,000 in the year 2012 [2].

Lateral epicondylitis commonly referred as tennis elbow is the most common condition occurring at the elbow joint. Historically, lateral epicondylitis has been recognized since more than a century. Runge first described this clinical entity in 1873. It received its name since more than 100 years ago (3). It is a pathologic condition of the wrist extensor muscles at their origin on the lateral humeral epicondyle. The tendinous origin of extensor carpi radialis brevis (ECRB) is the area of pathologic change. This can also be found in the musculotendinous structures of the extensor carpi radialis longus, extensor carpi ulnaris, and extensor digitorum communis. The involvement of ECRB muscle is due to excessive strain. Overuse or repetitive trauma in this area causes fibrosis and micro tears in the involved tissue [4]. The most common cause of lateral epicondylitis in tennis players is a "late", mechanically poor backhand that places excess force near the extensor wad. Other contributing factors include incorrect grip size, string tension, poor racquet "dampening" and underlying weak muscles of shoulder, elbow and arm. The term lateral epicondylitis is a misnamed because it also occurs in non-tennis players' also [3]. In lateral epicondylitis, patient mainly complains of pain and decreased function affecting activities of daily living, the pain is often caused on flexion and extension of the wrist and due to pronation and supination activities. Point tenderness typically occurs over the ECRB origin at the lateral epicondyle on physical examination. Lateral epicondylitis is assessed using three special tests-Cozen's, Maudsley and Mill's test.

The Numeric Pain Rating Scale (NPRS) is a one-dimensional measure of pain intensity in adults, involving those with chronic pain due to rheumatic diseases. The NPRS is a segmented numeric version of the visual analogue scale (VAS) in which a respondent selects a number (0–10 integers) reflecting the intensity of his/her pain. The common format is a horizontal bar or line. Similar to the VAS, the NPRS is anchored by terms describing pain severity extreme. Although various iterations exist, the most commonly used is the 11-item NPRS. The 11-point numeric scale ranges from '0' which represents one pain extreme (e.g. "no pain") to '10' that

represents the other pain extreme (e.g. “pain as bad as you can imagine” or “worst pain imaginable” (5). The most tender spot is located 1 to 2 cm distal to the radial epicondyle. Grasping or pinching with the extended wrist usually reproduces the pain precisely at the point of tenderness. Hence the grip strength is affected due to weakness of the extensor muscles and pain [6].

The PRTEE, formerly known as the Patient-Rated Forearm Evaluation Questionnaire (PRFEQ), is a 15-item questionnaire designed to measure forearm pain and disability in participants with lateral epicondylitis (also known as “lateral epicondylitis”) [7].

Treatment protocol for lateral epicondylitis mainly includes rest, ice, non-steroidal anti-inflammatory drugs, range of motion exercises, stretching, strengthening exercises, counterforce bracing, iontophoresis, acupuncture and ergonomic adjustments or training [3].

Lateral epicondylitis may be acute (0-6 weeks) or chronic (6-12 weeks) depending upon its duration. According to its duration the treatment would vary. Now a day’s therapists choose manual approach towards the treatment of lateral epicondylitis that is Myofascial Release (MFR) and Active Release Technique (ART).

MFR is a soft tissue manual therapy technique that stretches neuromuscular and fascial elements of connective tissue. It can be termed as direct manual therapy technique. Tightening of the myofascial system is a physiological, and bio mechanical protective mechanism in response to trauma. Due to tightening, the connective tissue that is the pliability of the fascia is lost, which is thereby restricted and is a source of tension to the rest of the body. The ground substance solidifies followed by the collagen becoming dense and fibrous elastin losing its resiliency. Over the time, this leads to poor muscular biomechanics altered structural alignment and decreased strength, endurance, motor coordination. Subsequently, the patient is in pain and functional capacity is lost. The objective of myofascial release is to elongate and soften the connective tissue, creating permanent three-dimensional length and width. For this purpose, a sustained pressure is applied into the restricted tissue barrier and holds, and few releases the tissue will become soft and pliable. When the myofascial length is restored, pressure is taken off the pain sensitive structures like nerves and blood vessels as well as restores alignment and mobility of joints (3). MFR can be used to treat pain and increase mobility in participants with a wide range of conditions, including back pain, neck pain, and fibromyalgia. There are many athletes that have found MFR to be helpful. (8)

ART was developed by P. Michael Leahy. Participants with overuse injuries & micro trauma tears are benefited with ART. Scar tissue restricts the soft tissue, weakens and shortens muscles, increases soft tissue tension which leads to inflammation and tendonitis, and therefore can compress nerves, leading to pain. ART applies manual pressure while lengthening tissue (patient moves muscle through ROM). It is the combination of site specific manual pressure with precise movement of the patient (usually flexion or extension) that makes ART unique to other manual therapy. The forearm has cross tissues which are situated at oblique angles to one another which thereby produce adhesions, fibrosis and local oedema due to reactive changes and thus causing pain and tenderness. Patient’s **a**ctive movement puts the A in ART. ART causes muscle to lengthen which can increase ROM and strength. Muscle, tendon; ligaments are able to move more freely as well as take pressure off the nerve and can relieve pain.

ART is exceptionally helpful for patients with chronic pain syndromes [9].

Methodology

Data was collected from The Department of Orthopaedic physiotherapy, Dr. A.P.J. Abdul Kalam COPT, Pravara institute of medical sciences, Loni. The study design was Prospective and comparative which included 20 participants. The study duration was 4 months with a intervention of 3 weeks and 4 days per week. The equipments used were JT Tool, Ultrasound machine, Omni gel, aquasonic gel, Jammar hand dynamometer. The participants were included according to the selection criteria, participants with acute lateral epicondylitis; with the age group of 20-60 years both males and females were included in this study. The participants with hand deformities, fractures, nerve injuries and with chronic lateral epicondylitis were excluded from the study.

Procedure

Ethical clearance (PIMS/CPT/IEC/2016/16376) was obtained from instutional ethical committee of Dr. A. P. J. Abdul Kalam College of physiotherapy, loni.

20 participants were included in this study based on the selection criteria. The participant’s demographic details such as age, dominance of each participant were noted before proceeding the study and a detailed assessment was done.

They were explained about the study and intervention. The participants were briefed about the nature of study, the duration of intervention and the intervention being used in the language best understood by the participants. They were encouraged to clarify queries regarding the study, if any. An informed written consent form, previously approved by the institutional ethical committee was then obtained from the participants.

The participants were randomly divided into two groups A & B. Each group included 10 participants where group A consisted of MFR + Ultrasound treatment. Group B consisted of ART + Ultrasound treatment. Numerical pain rating scale was used to evaluate pain, functional performance was evaluated by using PRTEE Questionnaire, The hand grip was evaluated at the beginning and end of four weeks with hand dynamometer and the outcome measures were evaluated. The period of intervention was 3 weeks for 4 days per week and after 3 weeks pain, grip strength and functional performance was reassessed for the outcome.

A**ctive Release Technique (ART)**

ART was given with participant seated, elbow flexed and resting on the treatment table, forearm in midprone & wrist in neutral position and then the therapist worked on the extensor carpi radialis longus and brevis muscles by applying pressure to the muscles distal to their attachment at the elbow. The participant started with the elbow flexed and wrist in neutral position. As the therapist hold the muscles, the patient extended the elbow and pronated and flexed the wrist while

the therapist moved the pressure proximally, attempting to release adhesions around and between muscle planes. Total of 10 repetitions for of 8 minutes, 4 times a week for 3 weeks.

The Myofascial Release Technique (MFR)
MFR was given with patient sitting comfortably, shoulder in internal rotation, elbow pronation and flexion to around 15°, palm resting flat on the pillow and therapist standing to the side of the bed at the level of the patient's shoulder and facing the ipsilateral hand. JT tool was used to give MFR. Total of 10 repetitions for of 8 minutes, 4 times a week for 3 weeks.

Digital ultrasound Therapy
Company: Bionics
Power output: continous15 W/cm^2
Pulse: 21 W/cm^2
Power supply: 230V, 50Hz.
Power density: 3 watts
Frequency:1mhz.

Fig 1: MFR with JT tool through the course of ECRB

Fig 2: MFR with JT tool through periosteum of ulna

Fig 3: MFR with JT tool through common extensor origin to extensor retinaculum

Fig 4: Ultrasound to the lateral epicondyle

Fig 5: Measuring grip strength using hand dynamometer

Data Analysis

Table 1: Demographic representation of gender.

Gender	No of participants
Male	14
Female	06

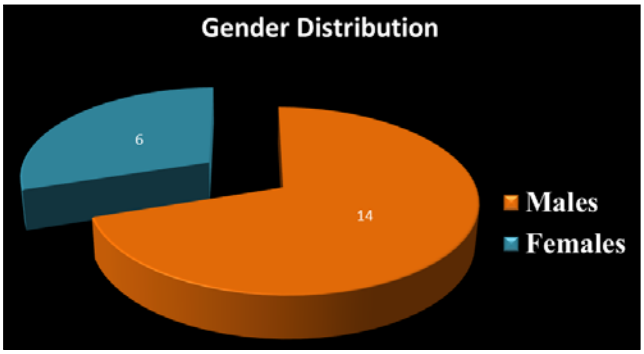

Fig 6: Shows demographic representation of gender

Result no 1: The above Pie diagram represents total number

of participants with Lateral epicondylitis, of which 6 were Females and 14 were Males.

Table 2: Comparison of mean of pre and post values of Group A.

JT Tool	Mean+-sd	p value	T value
Pre	7+-1.054	< 0.0001,considered extremely significant	11.384
Post	3.4+-1.075		

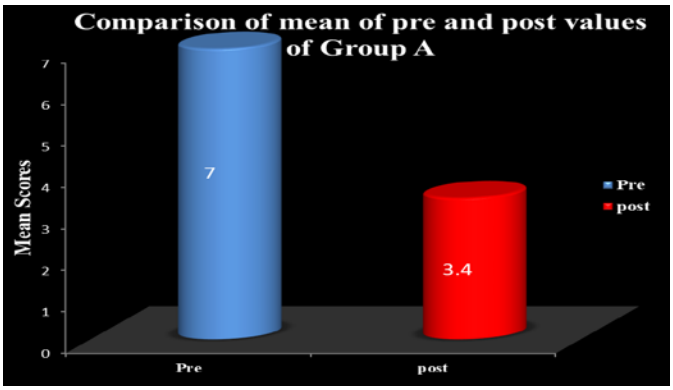

Fig 6: Represents comparison of mean of pre and post values of Group A.

Result no 2: Comparison of mean of pre and post of JT tool participants were t value is 11.384 and p value is <0.0001, considered extremely significant.

Table 3: Comparison of mean of pre and post values of Group B.

ART	Mean +- Sd	p value	T value
Pre	6.9+-1.197	0.0003,considered extremely significant	5.811
Post	4.6+-1.776		

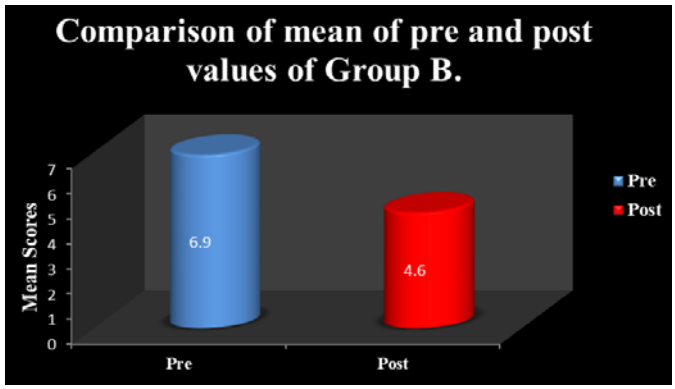

Fig 7: Represents comparison of mean of pre and post values of Group B.

Result no 3: Comparison of mean of pre and post Active release of technique participants with t value 5.811 and p value is 0.0003,considered extremely significant.

Table 4: Comparison of post interventional mean values of Group A and B.

Group	Mean+-SD	p value	T value
Group A	3.4+-1.075	0.0842,considered not quite significant	1.828
Group B	4.6+-1.776		

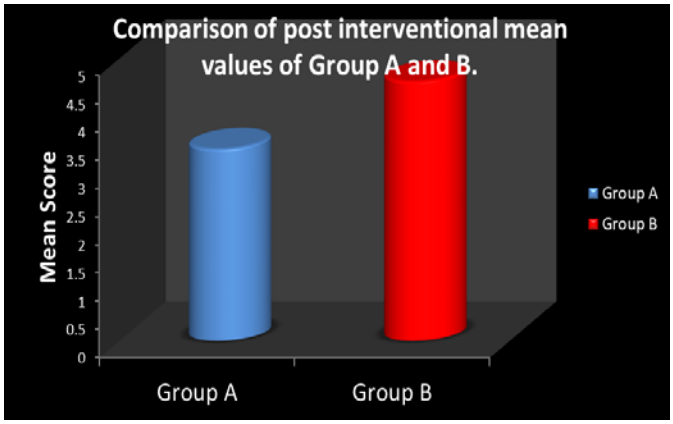

Fig 8: Represents comparison of post interventional mean values of group A and group B.

Result no 4: Comparison of post interventional mean of group A and group B were t value is 1.828and p value is0.0842, considered not quite significant.

Table 5: Comparison of pre and post mean values of hand grip strength of Group A and B.

Grip strength	Mean+-sd	P value	T value
Pre	23.128 +- 8.388	0.0001 considered extremely significant	6.280
Post	24.93+-8.434		

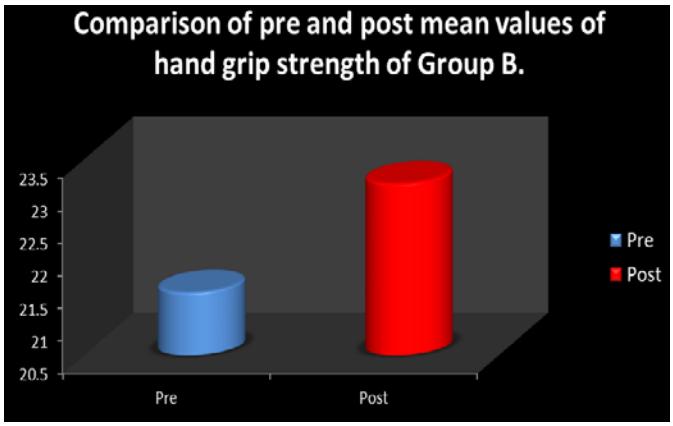

Fig 9: Represents comparison of pre and post mean values of hand grip strength of Group A and B.

Result No 5: Comparison of pre and post of mean of hand grip strength of MFR participants. With p value 0.0001 and t value 6.280.

Table 6: Comparison of pre and post mean values of hand grip strength of Group B.

Art hand grip	Mean +-SD	P value	T value
Pre	21.463 +-7.626	<0.0001,considered exytremely significant	8.955
Post	23.131+-7.808		

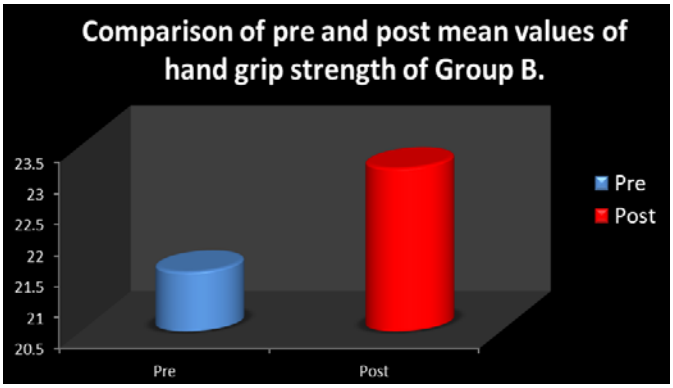

Fig 10: Represents comparison of pre and post mean values of hand grip strength of Group B.

Result No 6: Comparison of pre and post of mean of hand grip strength of ART participants with t value 80955 and p value 0.0001 considered extremely significant.

Table 7: Comparison of post interventional mean values of Hand grip strength of Group A and B.

Hand grip	Mean +-sd	P value	T value
Group A	24.93+-8.343	0.7623 considered extremely significant.	0.4950
Group B	23.131+-7.808		

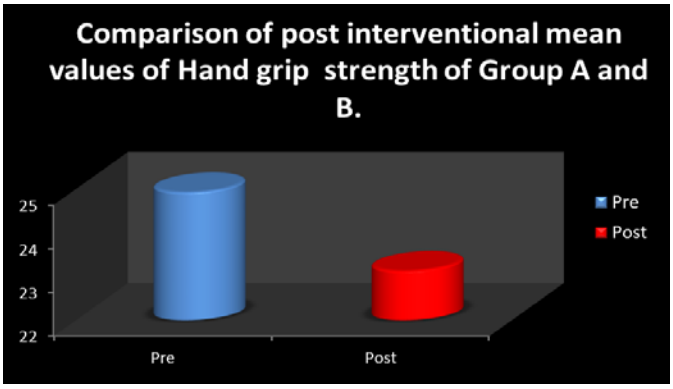

Fig 11: Represents Comparison of post interventional mean values of Hand grip strength of Group A and B.

Result no 7: Comparison of mean of group A and group B of hand grip with T value 0.4950 and p value 0.7623, considered extremely significant.

Table 8: Comparison of mean values of PRTEE questionnaire of Group A.

Prtee	Mean+-SD	P value	T value
Pre	67.5+-5.121	<0.0001,considered extremely significant	13.522
Post	43.75+-4.430		

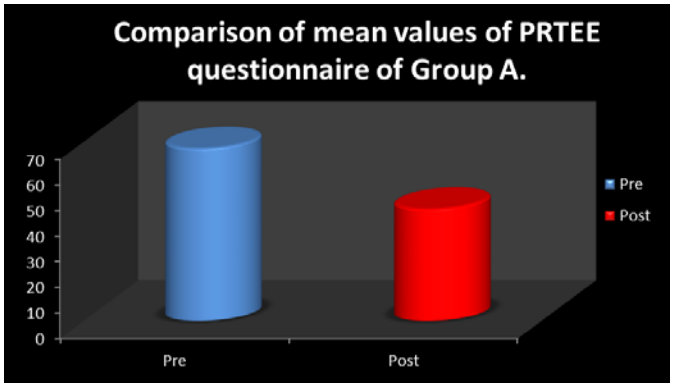

Fig 12: Comparison of mean values of PRTEE questionnaire of Group A.

Result no 8: Comparison of pre and post of mean of MFR participants with t value 13.5221 and p value 0.0001 considered extremely significant.

Table 9: comparison of mean values of PRTEE questionnaire of Group B.

Prtee	MEAN+-SD	P value	T value
Pre	57.4+-5.358	0.0012,considered very significant	4.679
Post	49.25+-4.523		

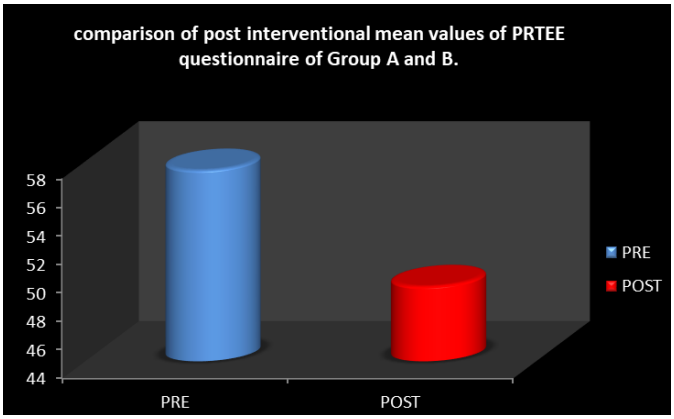

Fig 13: comparison of mean values of PRTEE questionnaire of Group B.

Result no 9: Comparison of pre and post of mean of ART participants with t value 4.679and p value 0.0012, considered very significant.

Table 10: comparison of post interventional mean values of PRTEE questionnaire of Group A and B.

Prtee	Mean +-SD	P value	T value
Group A	43.75+-4.430	0.0133, considered significant.	2.747
Group B	49.25+-4.523		

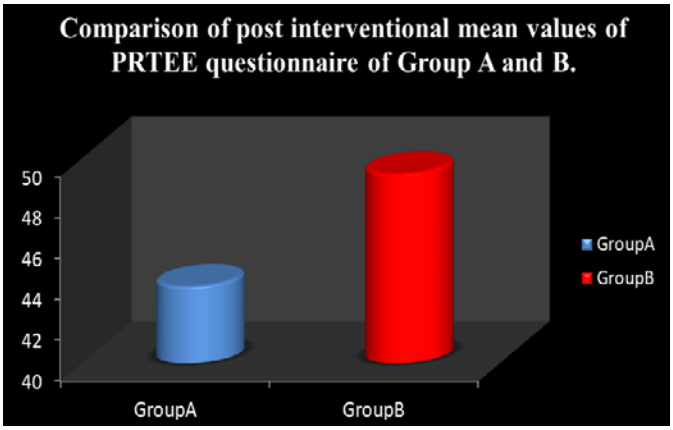

Fig 10: comparison of post interventional mean values of PRTEE questionnaire of Group A and B.

Result no 10: Comparison of mean of group A and group B on PRTEE questionnaire with t value is 2.747 and p value 0.0133.

Discussion

This study evaluated the Comparison between MFR and Active release technique in acute lateral epicondylitis participants. The results of this study showed that there was significant difference in pain intensity after 3 weeks of intervention in both group A (MFR + Ultrasound) and group B (Active release technique+ Ultrasound) in participants with Acute lateral epicondylitis.

The mean baseline value for pain using Numerical Pain Rating Scale (NPRS) before intervention in group A was 7+-1.054 and in group B was 6.9+-1.197. After intervention the mean pain value in group A was 3.4+- 1.075 and in group B was 4.6+- 1.7761 respectively. There was extremely significant difference found in pain intensity within these groups and on comparison of both the groups the pain intensity was not quite significant.

In group A, the mean baseline value for hand grip strength using hand dynamometer pre intervention was 23.128 +-8.388 and post intervention was 24.93+-8.434. In group B, the mean 10;baseline value for hand grip strength using hand dynamometer pre and post intervention was 21.463+-7.626 and 23.131+-7.808 respectively. The result of this study showed that there was extremely significant improvement in hand grip strength in group A and B when assessed individually, and even on comparison between both groups

In group A, the mean baseline value for functional performance using PRTEE scale, pre intervention was 67.5+-5.121 and post intervention was43.75+-4.430. In group B, the mean baseline value for functional performance using PRTEE scale pre and post intervention was 57.4+-5.358 and 49.25+-4.523 respectively. The result of this study showed that there was extremely significant improvement in functional performance in group A and B when assessed individually, and even on comparison between both groups.

The result of the present study showed that intervention was effective in both the groups but the additional effect found in group A was may be because of MFR using JT tool. Thus, the study concluded MFR using JT tool given along with ultrasound is more effective in reducing pain and improving functional performance in participants with acute lateral epicondylitis.

Objective of MFR is to elongate and soften the connective tissue, creating permanent 3 dimensional lengths and width. For this purpose, a sustained pressure is applied into the restricted tissue barrier and after 90-120 seconds the tissue will undergo histological length changes allowing the first release to be felt. The therapist follows into a new barrier and holds, after few releases the tissue will become soft and pliable. Restoration of myofascial length will take the pressure of the pain sensitive structures like nerves and blood vessels as well as restore alignment and mobility of the joints.

The core benefit of ART is preventing and breaking of dense scar tissue, also called adhesions. Adhesions limit the normal range of motion of joints and muscles because they cause abnormal binding between muscle groups, are very tough and are inflexible compared to healthy tissues. The reason that adhesions form is to bind injured tissues and keep them stable-however, the adhesions act like a strong “glue” and can often compress or pinch nerves. Nerves sometime become entrapped by scar tissue, which causes trigger points and pain to develop. The more that scar tissue forms, the more joints or tendons become strained and nerves become compressed.

Thus the current study proved that, participants were benefited with both the interventions, but on comparison MFR was more effective than ART. Similar results were found when a study was conducted by C.U shah *et al* (2014) to compare MFR and ART on pain, grip, strength and functional performance in patient with chronic lateral epicondylitis. The study revealed that MFR and ART are effective in participants with chronic lateral epicondylitis but myofascial release technique demonstrated better outcomes[3]

Conclusion

The present study concluded that MFR was more effective then Active release technique when compared on Hand Dyanomometer for improving hand grip strength and on PRTEE Questionnaire but when NPRS was compared both were effective.

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