



Effect of Oculus Guided Physical Therapy in Adjunct to Conventional Therapy in Lateral Epicondylitis Patients

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Study Protocol

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ABSTRACT

Background: Lateral epicondylitis (LE) is a very common condition musculoskeletal in nature affecting the elbow, causing significant pain, disability and loss of grip strength. The conservative management program for lateral epicondylitis includes rest, cryotherapy, and ultrasound, stretching and strengthening exercises. The Oculus Quest is a virtual reality headset. The oculus adventure game 'Hand Physics Lab' encourages you to try virtual reality in a new way by providing you complete control over your hands and fingers. VR is a developing technology that can be a valuable supplement to conventional therapeutic modalities.

Methods: In this study, a total of 60 patients with lateral epicondylitis will be included and divided into two groups of 30 participants each of age group 25-45 years. Group A will undergo conservative management of lateral epicondylitis and Group B will undergo oculus therapy by a hand tracking game 'Hand Physics Lab' along with the conservative management. Visual analog scale, Range Of Motion, PRTEE scale are used as outcome measures before and after the treatment and results will be analyzed.

Discussion: In this study the effect of oculus guided therapy with conventional Physiotherapy over conventional physiotherapy will be investigated in improving functional level and reducing pain in

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patients with LE. Individuals in mechanical professions or recreational activities with repetitive stress and intensive usage of forearm muscles are more likely to develop lateral epicondylitis. Physical therapy is now widely accepted as a standard treatment option for persistent lateral epicondylitis. Furthermore, this study can be useful in applying recent advancement in virtual reality for the betterment of health. This study can provide virtual reality in tennis elbow patients for improved motion control, improved quality of life and more patient entertainment to encourage motor learning.

Keywords: *Lateral epicondylitis; conservative therapy; virtual reality rehabilitation; oculus quest; tennis elbow.*

1. INTRODUCTION

Lateral epicondylitis (LE) is a musculoskeletal condition causing significant pain, disability in elbow region and loss of grip strength [1]. Lateral epicondylitis is a form of strain injury because of repetitive action that occurs as a result of overuse of tendon and failure to heal. The most common location of maximum pain is distal and anterior to the lateral epicondyle [1]. The most commonly affected ones are 30 to 50 years old [2]. Tennis elbow affects the dominant arm more often, compared to a general population annual incidence of 1-3 percent, which rises to 19 percent in the 30-60 year old population, and tends being more long-standing and serious in women [3].

The conservative management program for lateral epicondylitis includes rest, cryotherapy, ultrasound, stretching and strengthening exercises [4]. Virtual reality is an ingenious technology that involves real-time simulation and interaction between a person and a device. There are a variety of VR devices available that can be used for rehabilitation in both a clinical and at-home environment. These are the ones. VR is divided into two categories: "specialized" VR and "gaming" VR [5]. VR is a developing technology that can be a valuable supplement to conventional therapeutic modalities [6]. For gait and hand dexterity, studies have shown some efficacy of VR-based approaches using both specialized and gaming VR systems [5].

Oculus quest is a virtual reality device. The 'Hand Physics Lab' game on oculus quest encourages you to try virtual reality in a new way by giving you complete control over your hands and fingers, allowing you to interact physically with your surroundings and a variety of items, puzzles, and experiences [7]. The conservative therapy has been proven to manage lateral epicondylitis to a great extent. VR technologies

allow the development of a virtual environment in which the patient can receive safe and successful training and recovery by adjusting the exercise intensity and feedback.

This study will be conducted to find the effectiveness of conventional Physiotherapy in reducing pain and improving functional level in patients with LE and to find the effectiveness of oculus guided therapy with conventional Physiotherapy in improving functional level and decreasing pain in patients with Lateral epicondylitis and to investigate the effect of oculus guided therapy along with conventional Physiotherapy over conventional physiotherapy in reducing pain and improving functional level in patients with Lateral epicondylitis.

2. METHODOLOGY

2.1 Study setting

Musculoskeletal Physiotherapy OPD, Ravi Nair Physiotherapy College,

2.2 Study Design

Randomised control study.

2.3 Eligibility Criteria

2.3.1 Inclusion Criteria

Patient who are clinically diagnosed as chronic tennis elbow with Positive Cozen's test and Mills test both male and female with age between 25-45 years. Patients with unilateral tennis elbow will be included.

2.3.2 Exclusion criteria

Exclusion criteria was those who are less than 25 years and more than 45 years of age. Case with bilateral symptoms or with shoulder and cervical

involvement. Immobilisation and inflammatory arthritis cases were also excluded. Fibromyalgia and myositis ossification, carpal tunnel syndrome were also excluded. Bilateral tennis elbow patients will be excluded and the patients with any secondary complications will be excluded

2.4 Interventions

The subjects will be divided into two groups. Each group will consist of 30 subjects and their demographic data will be collected.

Group A: Conventional group Group B: Experimental group

2.4.1 Group A

The participants in this group will undergo conservative therapy for lateral epicondylitis. It includes pulsed ultrasonic therapy at 20% duty cycle, frequency 3MHz and an intensity of 1.2 W/cm² for 5 min given at the tenoperiosteal junction of the extensor carpi radialis brevis [1]. Cryotherapy will be given over the lateral epicondyle for 10 minutes, temperature >13 degree Celsius [8].

Stretching exercises include wrist extensor stretching, with patient in supine, elbow extended, forearm pronated and wrist in flexion and ulnar deviation as per patient's tolerance. This position has to be held for 30-45 seconds, 3 times before and 3 times after strengthening exercise, 30 sec. rest between each procedure [9]. Wrist flexor stretching by wrist extension (hold for 10 seconds – 10 repetitions) and twisting a towel roll in either directions (10 repetitions) are also included.

Strengthening exercises include resisted forearm extension, grip using exercise putty or a towel roll, resisted pronation and supination, resisted radial and ulnar wrist deviation, unilateral biceps flexion, and triceps extension [10]. Resistance training will start with manual resistance initially and will proceed to increase in no. of repetitions and resistance using dumbbells and weight cuffs.

2.4.2 Group B

The participants in this group will receive oculus quest guided therapy along with the conservative therapy (ultrasound, cryotherapy, stretching and strengthening exercises) as described earlier.

The oculus therapy will be given by 'Hand Physics Lab' which is a hand-tracking game for

wrist and hand rehabilitation [11]. The game involves movements of the forearm, wrist and fingers in the form of a video game like the game of zenga. The participant will be asked to play a complete sequence of the game until the end, moving the upper extremity in pronation, supination, hand gripping, wrist flexion and extension.

2.5 Participant Timeline

2 weeks of rehabilitation protocol will be given after enrolment in the study. 45 minutes each day of 5 days a week will be given. The evaluations will be performed at the beginning and at the end of their session.

2.6 Sample Size

This study enrolls a total of 60 patients which will be divided in two groups of 30 participants each. G power analysis was used to calculate sample size.

2.7 Recruitment

Prospective patients are advised to be referred to our In-patient department (IPD) and Out-patient department (OPD) by orthopaedists and health care practitioners affiliated with DMMSU. Patients undergoing rehabilitation in our IPD and have been diagnosed with lateral epicondylitis will be screened for program eligibility using inclusion and exclusion criteria.

3. METHODS: ASSIGNMENT OF INTERVENTIONS

3.1 Allocation

Sequentially Numbered Opaque Sealed Envelope (SNOSE) Technique will be used for allocation of the participants into either group

3.2 Implementation

The research coordinator and principal investigators will monitor the randomization process. Participants will be prompted to select a sealed group allocation from the envelope for recruitment into either group.

3.3 Blinding

To assign the participants to the groups, the tester(s) will be blindfolded. To ensure blinding,

subjects will be required not to disclose the tester anything about their treatment.

4. DATA COLLECTION, DATA MANAGEMENT AND STATISTICAL ANALYSIS

4.1 Data Management

Under the supervision of the chief investigators, data will be collected and reported. The research' documentation will be double-checked for accuracy. At the conclusion of the study, an allocation blinded statistician will be given the Excel spreadsheet to conduct the necessary analysis, after which the groups will be unblinded.

4.2 Statistical Analysis

The power of study is 80%. The level of significance is 5%.The software used will be SPSS 27.0 V. The reference of the study is Volvo Flygmotor AB 461 81 ct. al.

5. EXPECTED OUTCOME/RESULT

5.1 Range of Motion (ROM)

The extent of a joint's movement, measured in degrees of a circle, is called range of motion. This is the range of motion that a joint has. It is usually measured by a goniometer. An inclinometer can be used for the same [12].

5.2 Visual Analog Scale (VAS)

It is a scale used to measure the pain preserved by the patient in which 0 is no pain while 10 is the maximum pain [13].

5.3 Patient Rated Tennis Elbow Evaluation Scale (PRTEE)

PRTEE consists of two sections investigating the elbow joint i.e pain and function. All questions are graded on a scale of 1 to 10. The pain segment includes four questions that rank pain on a scale of 'no pain' to 'worst ever.' The function questions are graded on a scale of 'no difficulty' to 'unable to do.' The function segment contains 11 questions about basic daily activities, as well as four questions about personal care, household duties, occupational work, and recreational activities. Higher scores indicate weak results [14].

6. DISCUSSION

Lateral epicondylitis or simply lateral elbow pain, is a disorder in which the outer tendons of the elbow become inflamed. The cause of this ailment is unknown; however, there are some theories. There is no single name that everyone agrees on [15]. Individuals in mechanical professions or recreational activities who are subjected to repetitive stress and intensive usage of forearm muscles are more likely to develop LE [8]. Physical therapy is now widely accepted as a standard treatment option for persistent LE [10].

Manchanda and Grover conducted an experimental study on 30 subjects to see the Mulligan mobilization's effect against wrist manipulation along with conservative therapy in lateral epicondylitis. Both mobilization and manipulation have found out to be effective in improving strength and functional performance in the subjects [1].

Deepak Anap conducted a comparative study to study the effect of mobilization with movement as an adjunct to conventional therapy in patients with tennis elbow. The results proved both the techniques to be useful, but more effective in the group provided with mobilization with movement based on Mulligan principle along with conventional therapy [3].

In compared to conventional treatment, VR therapy has been found to result in improvements in the parameters studied, but not with statistical significance for all disorders. Specialized VR and gaming VR such as oculus quest can be beneficial in treating upper extremity conditions [16]. Oculus Quest interacts with the surroundings based on the motions of the patient by allowing immersion into a virtual environment combined with motion tracking and control of gestures [17]. Furthermore, this study can be useful in applying recent advancement in virtual reality for the betterment of health. This study can provide virtual reality in tennis elbow patients for improved motion control, improved quality of life and more patient entertainment to encourage motor learning.

7. CONCLUSION

Conclusion will be drawn post the study. Samples will be collected and statistical analysis will be done and the conclusion will be drawn based on the data collected.

CONSENT

The patient and one of the patient's family will provide informed consent on a printed form with their signatures, and the Principal Investigator will provide evidence of confidentiality. The participant and one of his or her relatives will be informed about the study, and the primary investigator will collect personal information as part of the procedure. The confidentiality declaration, as well as the signatures of the principle investigator, patient, and a witness, will be included on the consent form. If required to release some information for the study, the patient's consent will be sought with complete assurance of his or her anonymity.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval will be collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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