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A Comparative Analysis of Effectiveness of Mulligan's Mobilisation Versus Cyriax Approach in the Case of Tennis Elbow

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Abstract: Objective: To determine and compare the effects of the Cyriax approach and Mulligan's mobilization in lateral epicondylitis patients
Material & Methods: A Randomized Control Trial was conducted in Physiotherapy OPD of the University of Health Sciences after approval from the authority. Non-probability convenient sampling technique was used to collect the sample. The N=60 sample size was randomly allocated into two groups Group A i.e., the Mulligan group, and Group B i.e., the Cyriax group (DTF Massage & Mill's Manipulation), with 30 participants in each group having lateral epicondylitis. Data was collected in terms of age, gender, BMI, and occupation. VAS scale and TEFS were used to determine the level of pain and functional disability. Paired sample student *t–test* used to analyze the data. The significance level was set at $p<0.05$.
Results: The Cyriax group and Mulligan group both showed significant improvement in pain, and functional ability throughout the treatment duration. When comparing both groups regarding pain, Cyriax's approach showed significant improvement over Mulligan's approach.
Conclusion: Mobilization with movement and mill's manipulation with DTF massage (Cyriax), both are effective in improving pain, and functional ability in lateral epicondylitis. Cyriax's approach is more effective in relieving pain in lateral epicondylitis as compared to Mulligan's approach.
Keywords: tennis elbow, Mulligan mobilization, Cyriax approach, Mill's test, and VAS.

I – Introduction

Lateral Epicondylitis most commonly occurs in tennis players.[1] and nearly 40-50%of them experience this disabling condition, at least once during their playing lifespan.[2] Apart from "Tennis Players", lateral epicondylalgia is occasionally seen in people who had more upper limb enterprise such as forceful forearm pronation and supination, computer use, repetitive lifting, and heavy weight lifting. [3,4] The main source of epicondylitis is the uninterrupted strain on the tendon which is attached close to the distal segment of the humerus.[8] The average duration of occurrence of Tennis Elbow is between 6 months to 2 years. [5] It is a degenerative or failed healing tendon response characterized by the increased presence of fibroblasts, vascular hyperplasia, and disorganized collagen in the origin of the extensor carpi radialis brevis, the most affected structure.[6]
The incidence of Tennis Elbow has been announced to be 1% to 3% in the general population and four times more common in quadrennial.[7] The reported prevalence in workers involved in repetitive upper limb activities is 1.6% to 23.1%, while the lifetime prevalence of tennis elbow in players ranges between 40-50% [8,9] It is believed to be a retrogressive disorder.[10] The tendon(muscle), most often involved is the Extensor Carpi Radialis Brevis (ECRB) and sometimes the Extensor digitorum, Extensor Carpi Radialis Longus (ECRL), and barely Extensor Carpi Ulnaris.[11]
The possible reason for the frequent involvement of ECRB is its location as it is the one which is most laterally situated on the lateral epicondyle with slips taking origin from the radial collateral ligament.[12] Contractile overload that stresses the tendon for a long period near the attachment on the humerus is the chief cause of epicondylitis.[13] Patients with tennis elbow can be arranged into 2 groups a junior group with sports-related injury and a senior group with work-related injury, the last mentioned is much harder to treat.[14]

The syndrome is usually confined to the dominant arm but the occurrence of bilateral lateral epicondylitis may be due to more stress laid down the unaffected arm.[15] The prevalence of the dominant arm being affected is 1-3% in the general population, and it increases up to 19% at 30-60 years of age. [16,17] Clinically it can be confirmed by tests that reproduce the pain, such as palpation over the facet of the lateral epicondyle, resisted middle finger extension, resisted wrist extension, and passive wrist flexion.[18] The range of elbow movement is adequate.[19] The ailment is specified by pain over the lateral epicondyle, motor control deficits and muscle strength changes marked by functional impairments, and mechanical hyperalgesia.[20]

The concept of Mobilization with movement (MWM) of the extremities and SNAGS (sustained natural apophyseal glides) of the spine was first coined by Brian R. Mulligan [21]. Mobilization with movement (MWM) is the concurrent application of sustained accessory mobilization applied by a therapist and an active physiological movement to the end range applied by the patient. Passive end-of-range overpressure, or stretching, is then delivered without pain as a barrier [22].

Cyriax suggested the use of deep transverse friction massage in combination with mill's manipulation for the treatment of tennis elbow [23]. Many studies have shown favorable results with the Cyriax technique which has been used effectively since 1982. Cyriax HJ and Cyriax JP claimed substantial success in lateral epicondylitis treatment using – Deep Transverse Friction (DTF) in combination with Mill's Manipulation (performed after DTF) [24,25]. DTF is a specific type of connective tissue massage developed by Cyriax himself, performed at the exact site of the lesion with a depth of friction tolerable to patients. The numbing effect of DTF is because of the destruction of pain-provoking metabolites such as -Lewis's substance [26,27]. Goat GC (1994) suggested that pain relief might be due to: "the gate control theory" [28].

II – Methodology

This chapter deals with the methods used for the study. This includes the information on the subject, inclusion criteria, exclusion criteria, protocol, and procedures used in this study. source of data: physiotherapy opd of university health sciences, CSJMU, Kanpur. method of data collection is random, the sample size is 60 subjects and the study duration is 6 weeks. In inclusion criteria subjects willing to participate in the study, both genders males and females can participate, normal weight, stable vitals, asymptomatic subject with no history of any cardiovascular, or neuromuscular disease and there is no use of tobacco, non-alcoholics, and non-smokers in subjects. Exclusion criteria are if there is any difficulty in walking, vertigo, subject with normal BMI, any kind of neuromuscular, cardiovascular disease, asthma, pregnant females, and individuals involved in regular exercise or sports.

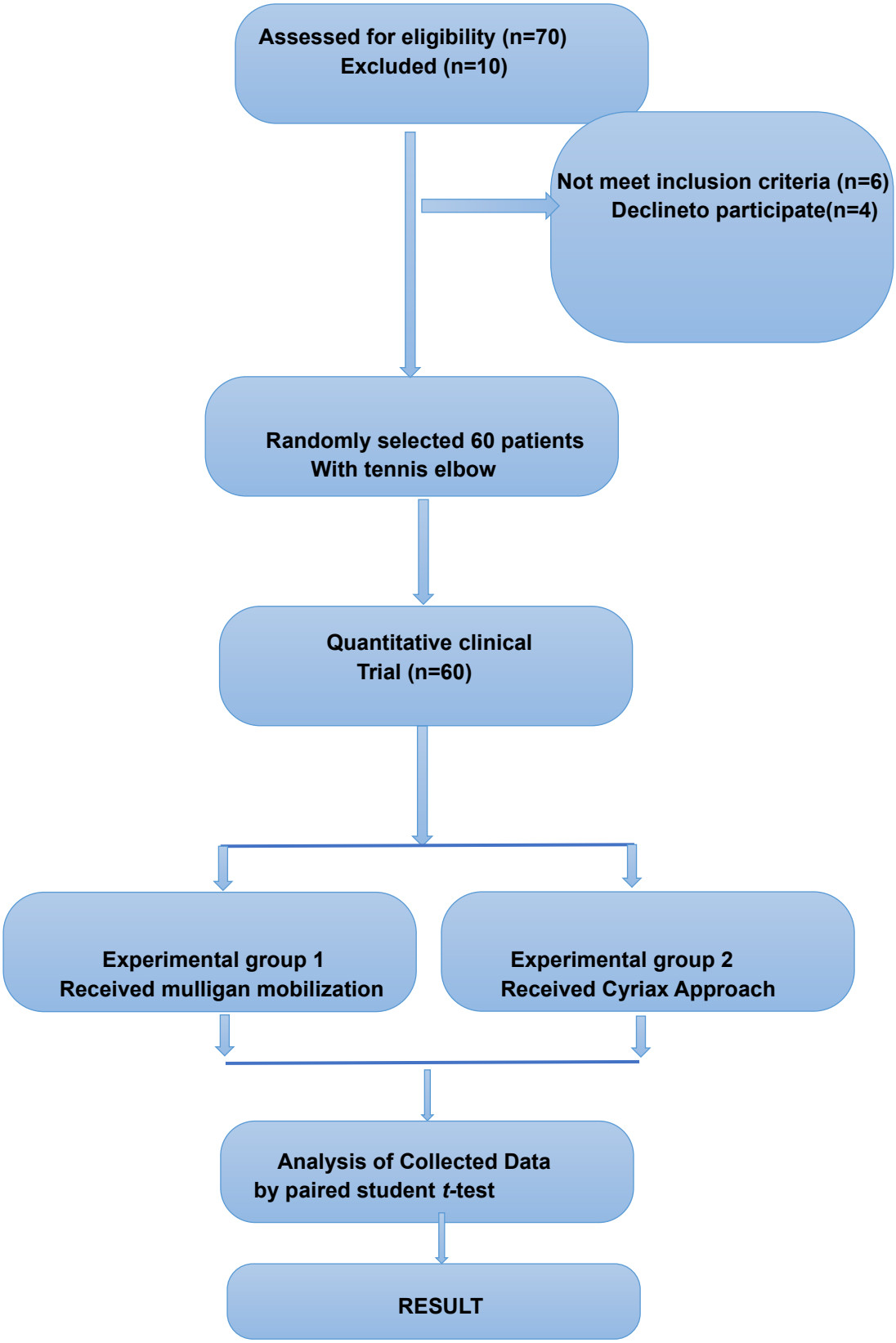
III – Procedure

Subjects were selected based on the inclusion & exclusion criteria. They were explained in detail about the type & nature of the study before participation. Consent was taken by each subject before participating in the study by signing a consent form that contained all the information necessary for them about the study. The procedure was explained in detail and all the necessary precautions were taken to avoid any inconvenience. Subject preparation was carefully done. They were asked to not to indulge in any kind of vigorous activity prior to the test or to take any heavy meal up to 1 hour by the test. All the subject was made sure to be properly hydrated and wore comfortable clothing & comfortable footwear. Before starting the test, the necessary assessment was done and vitals (BP, HR, RR, SPO2) were measured. All the necessary data such as Age, Sex, Height, Weight, and BMI were also documented.

With due consent of the patient, pre-examination will be done with the help of a visual analog scale and Tennis elbow functional scale. Hydrocollator packs will be given and grip strength will be evaluated using a grip dynamometer. Divide the patients into two groups with 30 patients in each group, group A will be given Mulligan mobilization and Group B will be given Cyriax Physiotherapy.

15 days of alternative therapy will be given to all the patients along with a pre-treatment hydro collator pack for 10 minutes. After the treatment session of each group of patients, post-examination of each

group will be done with the help of the previously mentioned outcomes measure including grip strength evaluation using a hand dynamometer, Mill's test, VAS scale, and tennis elbow functional scale.



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IV – Analysis

The data analysis was done by the software SPSS 2019 version – 26. The descriptive statistical analysis was done to determine the demographic characteristics of the subjects recruited in the present study. The paired-sample t–test was used in the analysis of the present study. P–value is used to test the hypothesis, which helps in deciding whether to accept or reject the null hypothesis. A commonly used value for the p–value is 0.05.

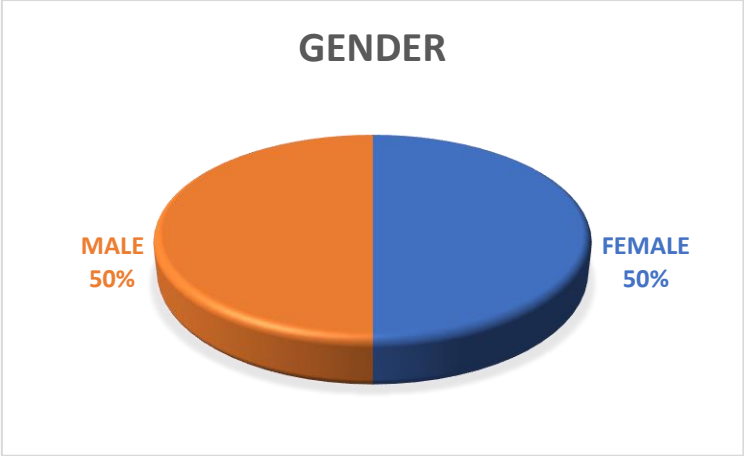


Chart 1: shows the gender wise percentage distribution of group 1: i.e., mulligan movement with mobilization

According to the gender wise distribution of subjects in group 1: i.e., Mulligan movement with mobilization out of 30, there were 50 % (15) people were Males and 50 % (15) people were Females.

TABLE 1: shows the Descriptive data of group 1 (Mulligan Mobilization)

	N	Minimum	Maximum	Mean	Std. Deviation
Age	30	28	40	34.23	4.454
weight	30	41	80	56.93	12.838
height	30	146	177	164.13	7.615
Body mass index	30	16	29	21.04	4.041

The Descriptive Data of **Table 1** shows that the average age of group 1 subjects was 34.23 years, the average weight was 56.93 Kg and the average height was 164.13 cm. The average BMI of group 1 was calculated to be 21.04. This shows that average participants were in the normal weight category in group 1.

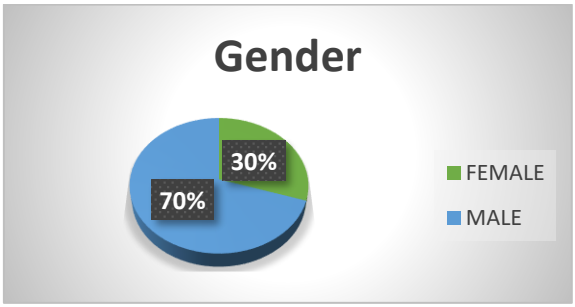


Chart 2: shows the gender wise percentage distribution of group 2: i.e., Cyriax approach

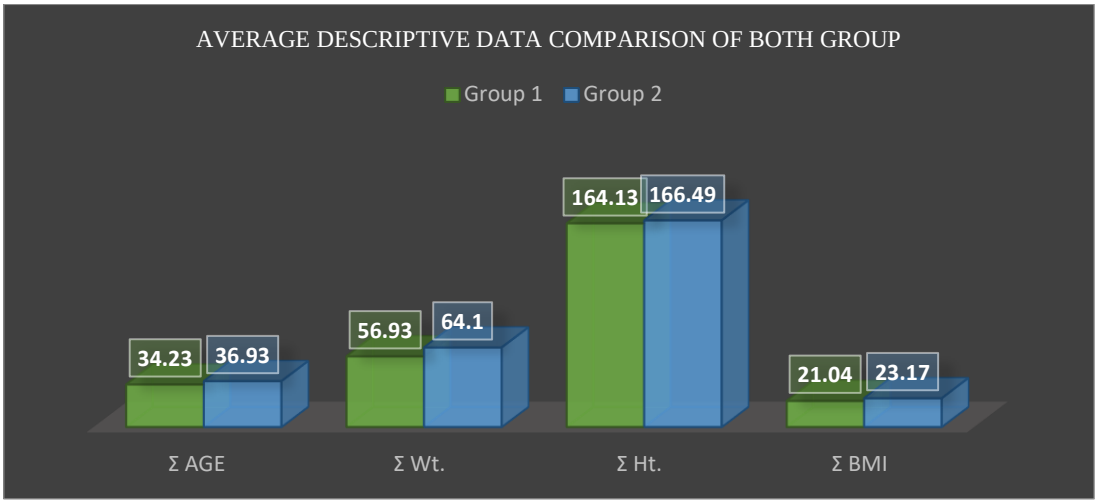
According to the gender wise distribution of subjects in group 2 i.e., Cyriax mobilization out of 30, there were 70 % (21) people were Males and 30 % (9) people were Females.

TABLE 2: shows the Descriptive data of group 2 (Cyriax Approach)

	N	Minimum	Maximum	Mean	Std. Deviation
age	30	25	54	36.93	10.389
weight	30	40	85	64.10	13.947
height	30	152	183	166.49	7.870
Body mass index	30	14	35	23.17	5.262

The Descriptive Data of **Table 2** shows that the average age of group 2 subjects was 36.93 years, the average weight was 64.10 Kg and the average height was 166.49 cm. The average BMI of group 2 was calculated to be 23.17. This shows that average participants were in the normal weight category in group 2.

Graph 1: shows an average comparison of descriptive data between both groups



Graph – 1 represents compare wise distribution of Age, Weight, Height, and BMI of all subjects of both groups i.e., group – 1: Mulligan mobilization and Group – 2: Cyriax Approach. A finding shows no significant difference in between all four parameters among both groups.

Table 3: shows the statistical data of group 1: Mulligan Mobilization

	N	Mean	Std. Deviation	Std. error mean	df	t – value	p - value
TEFS	30	4.700	2.003	.366	29	12.855	.000
VAS	30	2.200	.887	.162	29	13.590	.000

Table **3** shows the statistical data of difference between pre and post-intervention of recruited subjects of group 1, while analyzing the data it has been found that the Mulligan Mobilization was found significant in decreasing disability and reducing pain in the normal weight category. There is marked improvement in TEFS score with Mean (±SD) of 4.700 (±2.003) and t – value was 12.855 with *p–value* of .000, VAS with a Mean (±SD) of 2.200 (±.887) and t – value was 13.590 with *p–value* of .000. So, the above table shows that the Mulligan Mobilization was significant at the 95% of confidence level.

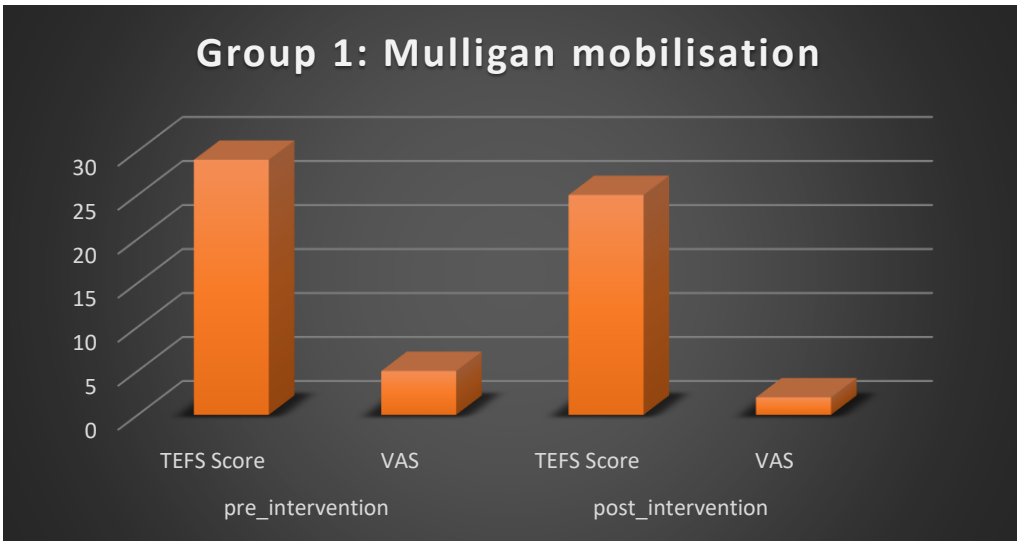
Table 4: showing statistical data of group 2: Cyriax Approach

	N	Mean	Std. Deviation	Std. error mean	df	t – value	p - value
TEFS	30	8.667	2.783	7.627	29	17.055	.000
VAS	30	3.900	.960	3.542	29	22.262	.000

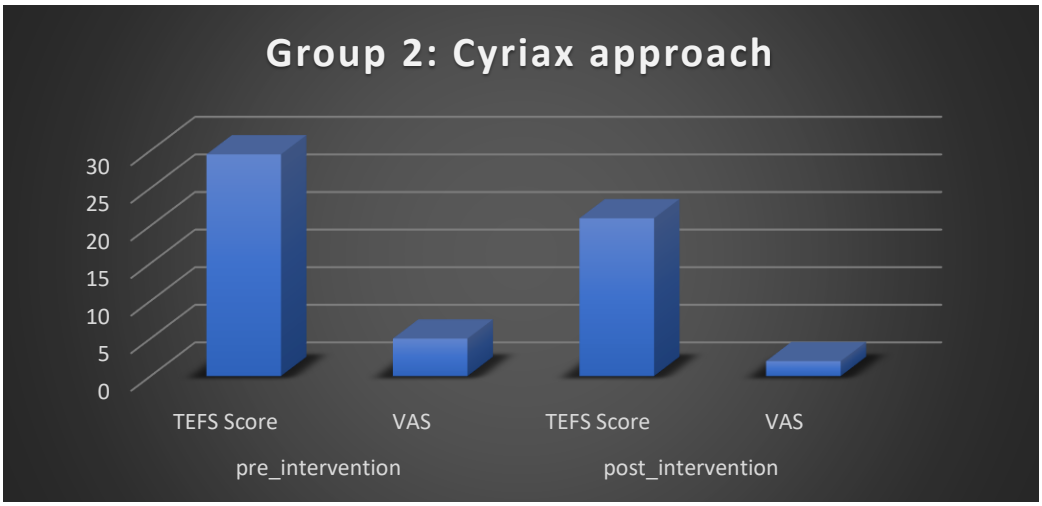
Table **4** shows the statistical data of difference between pre and post-intervention of recruited subjects of group 2, while analyzing the data it has been found that the Cyriax Approach was found significant in decreasing disability and reducing pain in the normal weight category. There is marked improvement in TEFS score with Mean (±SD) of 8.667 (±2.783) and t – value was 17.055 with *p–value* of .000, VAS with a Mean (±SD) of 3.900 (±.960) and t – value was 22.262 with *p–value* of .000. So, the above table shows that the Cyriax Approach was significant at the 95% of confidence level.

V – Result

In the present study, the statistical analysis with a 95% confidence level of paired samples t–test shows significant improvement i.e., the null hypothesis is rejected and the alternate hypothesis is accepted and we statistically observed a significant decrease in pain and reduced disability by Mulligan Mobilization or Cyriax Approach in normal weight tennis elbow patients.



Graph -2 represents the average data of Mulligan mobilization of all the recruited subjects in the present study, with pre and post-intervention. A finding represents that, statistically, Mulligan mobilization shows improvement in TEFS score in normal weight tennis elbow patients with Mean (±SD) of 4.700 (±2.003) and t – value was 12.855 with *p* – value of .000, VAS with Mean (±SD) of 2.200 (±.887) and t – value was 13.590 with *p* – value of .000.



Graph - 3 represents the average data of Cyriax Approach of all the recruited subjects in the present study, with pre and post-intervention. A finding represents that, statistically Cyriax Approach shows improvement in TEFS score in normal weight tennis elbow patients with Mean (±SD) of 8.667 (±2.783) and t – value was 17.055 with *p–value* of .000, VAS with Mean (±SD) of 3.900 (±.960) and t – value was 22.262 with *p–value* of .000.

VI – Conclusion

The present study was conducted among 60 people to find the Effectiveness of Mulligan's Mobilization Versus Cyriax Approach in the Case of Tennis Elbow. As per the result, hence we concluded that in the present study, the Null hypothesis is rejected and the alternate hypothesis is accepted. So, it has been concluded that both Mulligan Mobilization and Cyriax Approach are helpful in reducing disability and decreasing pain in normal-weight tennis elbow patients, but Cyriax Approach in normal-weight tennis elbow subjects shows marked improvement over Mulligan Mobilization.

VII – Discussion

The present study was done to determine whether the Mulligan Mobilization or Cyriax Approach is better to decrease pain and reducing disability in normal weight tennis elbow patients. The pre and post intervention were observed by TEFS scale and VAS scale. A total of 60 subjects were recruited for the study according to the inclusion and exclusion criteria. Those who are fulfilled the criteria were allowed to participate in the study. all the subjects were taken from physiotherapy OPD of University institute of health sciences (UIHS) department, C.S.J.M. University for investigation and experiment after screening.

The data collected from the study represents that null hypothesis is rejected and alternate hypothesis is accepted, which means both Mulligan Mobilization and Cyriax Approach is helpful in decreasing pain and reducing disability in normal weight tennis elbow patients, but Cyriax Approach in normal weight tennis elbow subjects shows marked improvement over Mulligan Mobilization.

We found same conclusion in 2022, Abbas, Sammar et al in their study **"effects of mulligan and cyriax approach in patients with subacute lateral epicondylitis"** concluded that Mobilization with movement & taping (Mulligan) and mill's manipulation with DTF massage (Cyriax), both are effective in improving pain, functional ability and handgrip strength in lateral epicondylitis. Cyriax approach is more effective in relieving pain in sub-acute lateral epicondylitis as compare to Mulligan's approach. On the other hand, functional ability, more improve with Mulligan's approach. Moreover, Mulligan approach is more effective in improving functional disability than Cyriax approach. But both treatments are equally effective in improving hand grip strength in sub-acute lateral epicondylitis.[33]

2022, Singh A. Kumar et al in their study "**Comparison of effectiveness of cyriax physiotherapy and mobilization with movement technique in patients with tennis elbow**" concluded that cyriax

physiotherapy treatment is more effective in relieving pain, improving functional disability and improving pain free maximal grip strength than mobilization with movement in the patients having tennis elbow.[34]
2021, Rajput, Nida et al in their study "**Effects of cyriax manual therapy versus mulligan technique on pain and grip strength in patients with lateral epicondylitis"** concluded that Cyriax manual therapy and Mulligan both were equally effective in improving pain whereas Cyriax manual therapy improved grip strength better than mulligan technique.[35]
2021, Sharif, Faiza et al in their study, "**effect of cyriax manual therapy versus mulligan technique on grip strength and functional outcomes in patients with lateral epicondylitis**" concluded that Grip strength was improved by Cyriax manual therapy better than mulligan technique, while Functional status was improved by Mulligan techniques better than Cyriax manual therapy.[36]
2019, Karthikeyan T, et al in their study "**Therapeutic efficacy of mulligan's mobilization versus low level laser therapy for the management of tennis elbow: A comparative study**" concluded that both the groups showed significant response to the treatment protocol. VAS and grip strength increased after a combined intervention of LLLT and MWM for a period of thrice a week for three weeks. LLLT was given by Helium-neon laser combined with IR diode with the wavelength 632.8nm; average power output 10 mw; emission mode modulated mode to 6 sites on and around the epicondyle. Each point was treated for 30 sec. MWM of three sets of ten glides with thirty seconds rest in between each set and each glide was sustained for approximately thirty seconds.[37]
2012, Ghosh, Pooja et al in their study "**Comparative Analysis of Cyriax Approach Versus Mobilization with Movement Approach in the Treatment of Patients with Lateral Epicondylitis"** concluded that Cyriax and Mulligan's approach both are equally good in treatment of Patients with Lateral Epicondylitis, and thus can be judiciously used in daily clinical practice, though group 2 i.e., Mulligan's group has shown superior result functionally.[38]
2012, Deepak B. Anap et al in their study "**Mobilization with Movement Technique as an Adjunct to Conventional Physiotherapy in Treatment of Chronic Lateral Epicondylits-A Comparative Study**" concluded that there was signiicant diference between manual therapy protocol and conventional therapy protocol in treating Chronic Lateral Epicondylitis. Manual therapy protocol was more beneicial than the conventional therapy protocol in eliminating pain of a previously painful active movement and the overall improvement in the condition. Investigation of long term efect of MWM technique for Chronic Lateral Epicondylitis in Indian population with large number of sample and longer session is important. Further research is required to ind out efect of MWM in structural faults related with Chronic Lateral Epicondylitis and mechanism of pain relief.[39]
The study's findings only applied to the population of patients who visited the physiotherapy outpatient department (OPD) at the University Institute of Health Sciences (UIHS) department at C.S.J.M. University. Gender differences in physical activity levels between men and women, as well as the effectiveness of interventions on outcomes, were not assessed.
This present study was conducted for a short period of time and with a small sample size; so long-term improvement in pain and functional disability was not observed. There is also a lack of resources, so future research involving a long time period and a larger sample size is also possible with the help of ample resources. The result of this study will be very helpful for the physiotherapist to choose whether the Mulligan mobilization or Cyriax Approach is best for decreasing pain and reducing disability in normal-weight tennis elbow patients.

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