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# Comparison of thrust manipulation and non-thrust mobilization techniques on pain in athletes with chronic ankle sprain

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***Abstract*---**Background: Chronic ankle sprains can be effectively treated with either thrust manipulation or non-thrust mobilisation of the ankle joint, according to a number of studies. On the other hand, it is unknown if thrust manipulation or non-thrust mobilization is superior to other techniques in terms of improving clinical and functional outcomes. Comparison of the pain-relieving benefits of thrust manipulation versus non-thrust mobilization was the primary objective of this study, which was conducted on athletes with chronic ankle sprains. Methodology: It was a randomized control trial. The study was completed from May 2021 to Jan 2022 and it was conducted at Pakistan sports board and Model town football club, Lahore. Purposive sampling techniques was used to collect the data as per inclusion criteria the participant age between 16 to 40 years males. Screening was carried out of 30 participants, 20 fulfilled the inclusion criteria and 16 finally gave written consent for enrollment in

the study. All the participants were placed into two groups by sealed envelope method. In group A high-velocity manual intervention was given at proximal and distal tibiofibular joint, and distraction thrust manipulation technique at talo-crural joint. In group B low-velocity manual physical therapy intervention to the talo-crural joint was given in anterior-to-posterior direction and non-thrust lateral glide along with eversion was given to the rear foot. Additionally, Achilles' tendon stretch with weight bearing, Alphabet exercises, Ankle eversion self-mobilization and dorsiflexion self-mobilization was given to both group A and B as a baseline exercise protocol. The patient completed the NPRS and GRoC as subjective measurement. Evaluation was done before session start and after the end of 8th week. 24 treatment sessions (3 sessions a week) were given to the subjects. Data was analyzed by using SPSS version 21. Results: There was statistically significant difference between groups and within group analysis of both treatment groups with p-value <0.01 in terms of pain in chronic ankle sprain. Conclusion: This study found that both muscle thrust manipulation and non-thrust mobilization were effective, but the method of thrust manipulation was clinically more effective in reducing pain in patients with chronic ankle sprain.

***Keywords*---**Chronic Ankle Sprain, Thrust Manipulation, Non-Thrust Mobilization, NPRS and Pakistan.

## Introduction

Musculoskeletal injuries, such as ankle sprains, are more common in players and those individuals who are physically active.(1-7). It's the most prevalent musculoskeletal injury in the athletic population, and so it occurs mostly during activities that require movements, such as starting, stopping, running, cutting and changing directions.(5, 8) Ankle sprains are caused by an athlete's weight being placed on toes, landing on a rough surface or landing on the foot of other athlete or player, resulting in an embarrassing situation and loss of balance and incoordination. A pop is felt by an athlete when a ligament around the ankle is stretched or torn. An ankle sprain during a sport can result in a variety of symptoms, including decreased performance, athlete absence from competition, negative psychological effects, decrease endurance and expensive health care. (6, 9).

An ankle sprain is one of the most common presenting injury of the musculoskeletal among the athletic population, which account for 10% - 30% of all particular sports related injuries. The ligamentous complex that stabilises the ankle from its lateral side is involved in about 85% of ankle sprains, i.e., Posterior talo-fibular, calcaneo-fibular ligament and anterior talo-fibular.(1, 10). The lateral ligament complex of the ankle joint is among the structure which get injured most commonly (11, 12) and one-third of those who sustain an ankle injury do not heal fully within a year. These injuries can have a major impact on daily activities as well as sports involvement. The lateral ankle sprain recurrence is a highly prevalent in musculoskeletal ailment among sportsmen.(13, 14).

A lot of studies regarding thrust/non thrust mobilization have been conducted but none of the studies describe that which one is better either thrust or non-thrust mobilization for the treatment of chronic ankle sprain. The rationale of the Comparison of the effects of manual thrust manipulation technique with non-thrust mobilization on pain and function in chronic and recurrent ankle sprain among athletes is that it will help the therapist in future to choose that technique, which is better to minimize pain and improve function in recurrent ankle sprain in athletes. It will help the therapist to choose either thrust or non-thrust mobilization for the treatment of the ankle sprain.

There was no research conducted that compared thrust manipulation and non-thrust mobilization; however, most of the studies have data on the combined influence of thrust manipulation and non-thrust mobilization with dynamic stretching and without foam rolling. There is also data on the cumulative impact of thrust manipulation and non-thrust mobilization with baseline exercises or even without baseline exercises for chronic ankle. Therefore, the purpose of this study was to evaluate and contrast the efficacy of non-thrust mobilization versus thrust manipulation in the treatment of athletes with chronic ankle sprains.

**Material and Methods**

The current study was a Randomized Control Trial. The study was conducted in Pakistan sports board complex and Model town football club. Sample size was calculated by Ausvet epi tool.

**Inclusion Criteria:** Athletes with Ankle sprain > 6 weeks; grade 1 and 2 ankle sprain, as defined by the West Point Ankle Sprain Grading System. Subjects with age from 16 to 40 years old Athletes. Positive Ankle Stress Test Anterior talo-fibular ligament: Plantar flexion – inversion, Calcaeno-fibular ligament: Neutral position– inversion, Posterior talofibular ligament: Dorsi-flexion– inversion, Deltoid ligament: Plantar flexion– eversion. Having a NPRS score more than 3/10 in the last week.

**Exclusion criteria**: If they presented any contraindications to manual/physical therapy. If red flags noted during the screening of the patient (e.g. fracture, tumor, osteoporosis, rheumatoid arthritis, having history of steroid use for a prolonged period of time, or intense disease vessels). Other exclusions criteria included surgery of the distal part of the fibula/tibia, ankle joint, and area of rear foot; fractures; ankle sprains of 3$^{rd}$ grade (as explained by the WPASGS) fracture or other absolute contraindications to physical therapy. Recurrent ankle sprain.

**Tools**

1. Numeric Pain Rating Scale (NPRS).
2. Global rating of change (GRoC).

**Treatment techniques:**
On patient's first visit. These steps were taken:

1. A complete physical examination, History and thoroughly assessment and ankle stress test was applied by researcher.

2. The patient was complete NPRS and GRoC as subjective measurement.
3. Patients was allotted through randomization into groups. Treatment was then continuing to the selected subject according to their allocation.
4. Subjects was reassessed by researcher at the end of 8th week of session.
5. 24 treatment sessions (3 sessions a week) was given to the subjects.

Patients were randomly allocated into two different groups; In Group A, the individuals were treated with (thrust manipulation) high-velocity manual intervention was given at proximal and distal tibiofibular joint, and distraction thrust manipulation technique at talocrural joint. In Group B treated with (non-thrust mobilization) low velocity manual physical-therapy intervention to the talo-crural joint was given in anterior to posterior direction and non-thrust lateral glide along with eversion was given to the rear foot. Additionally, weight bearing stretch to Tendon of Achilles, Alphabet drawing exercises, Self-mobilization of eversion of ankle and dorsiflexion self-mobilization was given to both group A and B as a baseline exercise protocol.
The data was analyzed using Window software SPSS version 25. Normality of the data was assessed by Shapiro Wilk test, parametric and non-parametric test was used for within a group and between groups analysis. Following analysis was conducted:
Independent sample t-test was applied to measure differences b/w two groups.
Paired Sample t-test was used to measure changes within each group.

**Results**

The participants were assessed on the basis of inclusion & exclusion criteria. 16 participants were selected according to the inclusion criteria. Below is the table 1 which summarize the information that, 8 participants were added in the group 1, thrust manipulation and 8 participants were added to group 2, non-thrust mobilization. In Group A, high-velocity manual intervention was given at proximal and distal tibiofibular joint, and distraction thrust manipulation technique at talocrural joint. In Group B, low velocity manual/physical therapy intervention to the talo-crural joint was given in anterior to posterior direction and non-thrust lateral glide along with eversion was given to the rear foot. Additionally, stretch of tendon of Achilles with weight, Alphabet drawing exercises, Eversion of ankle self-mobilization and dorsiflexion self-mobilization was given to both group A and B as a baseline exercise protocol. After the collection of data, pre-treatment and post treatment, after 4 weeks' data was analyzed through SPSS 25.

There was statistically significant difference between groups and within group analysis of both treatment groups with p-value <0.01 in terms of pain in chronic ankle sprain which is mention in the below table 1.

Table 1: Base line measurement for GROC and NPRS, non-dominant variables (mean±SD) score among Thrust Manipulation and Non-Thrust Mobilization group. (P > 0.05) there is no significant difference between both groups

| | Group A Thrust Manipulation (n=8) | Group B Non-Thrust Mobilization (n=8) | p-value |
|---|---|---|---|
| | (Mean ± SD) | (Mean ± SD) | |
| GROC | -5.50 ± 1.41 | -3.37 ± 1.40 | 0.09 |
| NPRS | 6.80 ± 1.01 | 6.75 ± 1.20 | 0.06 |

We used an independent sample t-test to compare the pre- and post-treatment Numeric Pain Rating Scale scores of the two groups as shown in the table 2 below. Statistical analysis showed that there was a significant difference (p0.05) between the two groups. Thrust Manipulation group revealed reduction in pain with mean value of as 2.75 ± 1.03 compared to Non-Thrust Mobilization group with mean value of 4.37 ±1.30.

Table 2: Between Group Comparison of Numeric Pain Rating Scale

| | | Treatment group | | p-value |
|---|---|---|---|---|
| | | Thrust Manipulation (n=8) | Non-Thrust Mobilization (n=8) | |
| NPRS | Pre-treatment (Mean±SD) | 9.37 ± 0.74 | 7.37 ± 1.40 | |
| | Post-treatment (Mean±SD) | 2.75 ± 1.03 | 4.37 ± 1.30 | 0.01 |

In the table 3 Paired sample t-test was performed to compare the values of Numeric pain rating scale within each treatment group. In thrust manipulation technique group the mean difference for NPRS post-treatment and pre-treatment values was 6.62 and for non-thrust mobilization group was 3.00. Results declared statistically a significant difference in both groups (p-value <0.05) with thrust manipulation technique group having remarkable difference.

Table 3: Comparison of Numeric Pain Rating scale across Thrust Manipulation and Non-Thrust Mobilization group.

| Study Group | | Paired Difference | |
|---|---|---|---|
| | | (Mean±S.D) | p-value |
| Thrust Manipulation | NPRS_PRE<br>NPRS_POST | 9.37 ± 0.74<br>2.75 ± 1.03 | <0.01 |
| Non-Thrust Mobilization | NPRS_PRE<br>NPRS_POST | 7.37 ± 1.40<br>4.37 ± 1.30 | <0.01 |

**Discussion**

The current study was aimed to compare the effects of thrust manipulation technique and non-thrust mobilization technique in male athletes having chronic ankle sprain on the following parameters global rating of change and numeric pain rating Scale. Stretching of tendon of Achilles while using the weights, Alphabet drawing exercises, Eversion of ankle self-mobilization and dorsiflexion self-mobilization was given to both group A and B as a baseline treatment. The Findings of the present study reveal that thrust manipulation exhibit significantly improvement in the terms of function, reduced pain and improved GRoC as compared with non-thrust mobilization. Statistically significant improvements were seen in self-reported questionnaire, pain in both groups. Similar findings were found when equating the efficiency of manual therapy & exercise (MTEX) to a home exercise program (HEP). MTEX approach is better as compare to the HEP for the treatment of inversion sprains of ankle.(15).

It is generally difficult to evaluate the muscle relaxation treatments (manipulation and mobilization) applied in patients with CNSNP, as shown by Crawford et al. in one of the recent reviews (16), as well as the effects of manual treatment protocol should be carefully considered as techniques which are unique in nature. The current body of evidence is characterised by its heterogeneity due to the vast range of methodologies that have been investigated using a limited number of samples. It is difficult to draw a comparison between the findings because of the differences in the tests and variables that were evaluated in each study. This is because there is no consensus regarding the topic. In addition to this, a large number of studies studied the impact of mobilization and manipulation of the ankle joint on physiological results (17-21). A new study on the short term response to thrust and non-thrust manipulation and exercise highlights the fact that CPR provides you with the capacity to select patients who wish to exhibit rapid short term recovery with treatment utilizing general flexibility workouts and manual therapy with postoperative inversion ankle sprain. (22)This study demonstrated statistically significant differences in pain at post intervention (NPRS ratings) among the both groups. This finding differs from previous studies. Manual therapy, in the form of manipulation and mobilization of joint, has been shown to be much effective with chronic ankle sprain in the reducing pain, but the combination of both manipulation and mobilization of joint is more efficacious(23). However, results of our study indicate that the level of pain in patients who receive thrust manipulation decreases more. The statistically very significant improvements were spotted likely have therapeutic significance as well. Specifically, in our study NPRS were found significant between group of thrust manipulation and non-thrust mobilization. Cleland et al (24) reported between-group mean differences was low for pain (NPRS) at 48 hours follow up. The results of this current study further supported the conclusions of Brantingham et al's systematic review(25) that MTEX is very effective for a short period of time in reducing the pain in the patients with an inversion sprain of ankle.

Although the exact process by which manual therapy produces its beneficial benefits is not yet fully understood, it is worthwhile to speculate about the various probable causes. Patients who have an inversion sprain of the ankle often show cognitive deficits at the joints that make a contribution to the mobility of the

ankle. These joints include the proximal part of the tibia and fibula, the distal part of the tibia and fibula, the talo-crural, and the sub-talar joints. This has been reported in the studies. It's possible that physical therapy could be helpful in recovering range of motion at these joints, which would lead to an improvement in the mechanics of the foot and ankle and a reduction in discomfort. Changes made to the definition of a repetition for the side hop test resulted in a reduction of the cut off score by Linens et al (26) of fifty percent. This change was brought about by the study.

In order to prove the effects of thrust manipulation technique as compare to non-thrust mobilization technique, a randomized control trial was conducted based on 8 weeks' time period under the direct supervision of the researcher (3 time per week, each session an hour). The result from this present study differ from the studies conducted by Bassett(27), who made a comparison between a mean value of 7.6 sessions of clinical exercise under supervision of a therapist to 4.6 sessions of supervised HEP progression. Contrarily to the results of this study where total 16 athletes were included. Eight of them got the thrust manipulation and other eight got the non-thrust mobilization. Both group A & group B showed a significant improvement after the interventions. Results showed that thrust manipulation technique has better effects as compare to non-thrust mobilization technique in reducing pain in athletes with chronic sprain of ankle. Limitations of our study were only male athletes in this study, so it is not possible to generalize these outcomes to the entire population and long term follows up wasn't conducted.

So, further research should have advocated to find the long term effects of interventions by proceeding follow up sessions. More randomized controlled trials needed to be conducted to prove longitudinal effects for thrust manipulation and for non-thrust mobilization as an independent technique in generalized population. More studies should be conducted with larger sample size including various study settings

**Conclusion**

Thrust manipulation technique was more effective as compare to non-thrust mobilization in reducing pain in athletes with chronic ankle sprain, and showed a remarkable difference between group analysis. Although both treatment techniques showed improvement within group analysis but the thrust manipulation showed better result.

**Authors' contribution**

All named authors contributed to the conceptualization of study, data collection and analysis and drafting and revision of the manuscript. They all take responsibility for all the contents and conclusions.

**Conflict of interest**

None of the authors declared any conflict of interests.

**Sponsorship and funding**

The study received no specific funding.

**Compliance with ethical principles**

The study was approved by the research ethical committee of Riphah International University, Lahore, Pakistan. Informed consent (verbal/written) was obtained

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