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Research article

Effectiveness of mulligan mobilization versus Maitland mobilization with common use of eccentric exercise for the treatment of Achilles tendinopathy in football players

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ABSTRACT

The purpose of this study was to compare the effectiveness of Mulligan Mobilization versus Maitland Mobilization with common use of Eccentric Exercise in managing Achilles Tendinopathy of a football player.

30 footballers age between 18 to 27 years, presenting with achilles tendinopathy were selected based on selection criteria by convenient sampling and were randomly allocated into two groups, group A (Mulligan Mobilization along with Eccentric exercise) and Group B (Maitland Mobilization along with Eccentric exercise). Each group had 15 patients and both the groups received intervention for 4 weeks.

Data was obtained on pain intensity levels via VISA- A (The Victorian Institute of Sports Assessment Achilles Questionnaire)

Statistical analysis was done by using paired t' test and independent t' test. The mean score of VISA-A increase from 31.8 to 86.6 in Group-A and in Group-B the mean score increases from 32.06667 to 79.733333. Paired 't'-test revealed that problem in Achilles tendinopathy patients has significantly increase in Group-A after applying Mulligan mobilization along with Eccentric exercise for 4 weeks i.e. (p=1.04578E-17), whereas paired

't test has also revealed that pain intensity reduced and functional activity increases in AT patients in Group- after applying Maitland mobilization along with Eccentric exercise for 4 weeks i.e. (p-9.00404E-13). Independent 't test revealed that pain is reduced & functional activity increases in patient with AT was increased significantly Group-A after applying Mulligan mobilization along with Eccentric exercise i.e. (P-0.000555828). So, when compared within the groups, both Mulligan mobilization along with Eccentric exercise and Maitland mobilization along with Eccentric exercise were effective in reducing the pain & increase in functional activity in patients with AT. But when compared between the groups, Group-A (Mulligan mobilization along with eccentric exercise) was found to be extremely significant in reducing pain intensity & increase in functional activity in patients with AT.

Both groups, Group-A (Mulligan mobilization along with Eccentric exercise) and Group-B (Maitland mobilization along with Eccentric exercise) have shown significant reduction in pain & increase in functional activity in patients with AT. However, Mulligan mobilization along with Eccentric exercise has demonstrated significantly better improvement in AT patients. Therefore,

the result of the present study shows Mulligan mobilization along with Eccentric exercise is much more effective treatment protocol for patients with AT.

Keywords: Achilles tendinopathy, Mulligan Mobilization, Maitland Mobilization, Eccentric Exercise, AT.

INTRODUCTION

Ankle injuries are most common medical and socio-economic problem. Many people suffered from traumatic injury of ankle; most of them are due to the results of sports. The total costs of the treatment and work absenteeism due to ankle injuries are high. The prevention of recurrences can result in large saving on medical costs [1]. The most frequent ankle and foot overuse injury is Achilles tendinopathy with the clinical feature of pain and swelling. Most ankle injuries happen when foot suddenly twists during fall, run. Football is the most popular sport worldwide and is associated with a high injury rate, most of them can result of trauma [1].

Ankle injuries are among the most commonly diagnosed injuries in the game. The result is reduced physical activity and endurance levels, lost game time, and considerable medical cost [2].

21 Famous football players like David Beckham, the former Manchester United legend tore his left Achilles tendon while playing on loan for Italian side AC Milan in March of 2010 had suffered from this problem which forced them to take months of break from their career [3].

A combination of pathological changes affecting the Achilles tendon usually due to overuse and excessive chronic stress upon the tendon or it may associate with an Achilles tendon tear [4].

In Achilles tendon, the risk of injury is lack of flexibility or stiffness. An irritation of achilles tendon, a thick band of tissue along the back of lower leg that connects the calf muscles to heel, it is common in overuse injury. As we know, it is the longest and strongest tendon in human body [5].

Stages

There are four stages of Achilles tendinopathy

Normal Tendon

Reactive Tendinopathy

It's an early stage of tendinopathy, result of an excessive and rapid load. In this stage there is a thickening of the tendon, painful and reversible. It's mainly happened in young age 15-25 years [6].

Tendon Disrepair

In this stage tendon unable to manage loads and architectural changes occurs inside the tendon, trying to repair, it is less painful and less reversible [7].

It happens in the young adult age, group between 20-35 years.

Degenerative Tendinopathy

It is a late stage of tendinopathy; tendon gives up on healing. Degeneration of the part happen in this stage; it is non- reversible. Age group is in between 30-60 years.

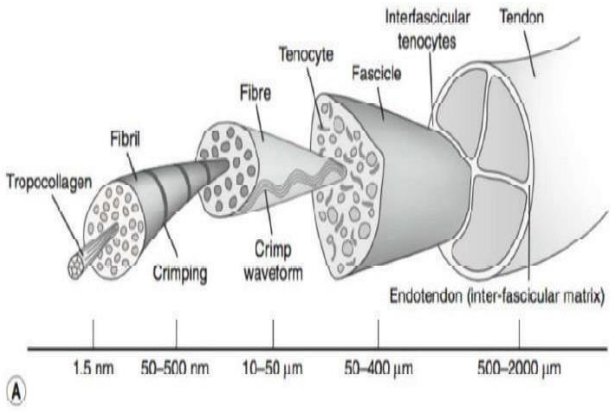
Reactive on Degenerative Tendinopathy

It is acute exacerbation of degenerative tendon.

Patho-anatomy

It originates from distal joining of the gastrocnemius and soleus muscle and inserts at the bottom of the calcaneus. The tendon has the power to resist the tensile force. A normal tendon consists of thin, cylindrical cells and an extracellular matrix. The tenocytes and tenoblasts are responsible for the synthesis of the extracellular matrix. In the inner part of matrix, there are bundles of type 1 collagen and elastin. This type 1 collagen is responsible for the strength of the tendon. There is a ground substance between the collagen which is made up of proteoglycans and glycosaminoglycans [5].

Figure 1



Types

There are two types of Achilles tendinopathy; they are as follows

Non - Insertional Achilles Tendinopathy

Pain is present at any point along the tendon, the most common area to feel tenderness is just above the heel known as mid portion achilles tendinopathy.

Insertional Achilles Tendinopathy

It may also be present where the tendon meets the heel, known as insertional achilles tendinopathy.

Maitland mobilization

Is effective in reducing pain and improving functional level. The Maitland Concept of manipulative

physiotherapy, it become to be known, emphasizes a specific way of thinking continuous evaluation, assessment and the art of manipulative physiotherapy known when, how, and which techniques to perform and adapt to the individual.

Table 1: Intrinsic and Extrinsic factor contrybuing to the development of Achilles tendinopathy.

Intrinsic factors	Extrinsic factors
General • Age • Gender • Weight and height • ABO blood groups A and O • Metabolic syndrome • Predisposing diseases • Oral contraceptives • Post-menopausal state • Fluoroquinolones • Decreased tendon vascularity • Hyperthermia	Sudden change in training pattern Increased intensity in training Poor technique Footwear Training surface: • Hard • Slippery • Uneven
Local • Gastrocnemius-soleus dysfunction • Muscle weakness and imbalance • Pes cavus deformity • Lateral ankle instability • Decreased subtalar motion • Forefoot pronation • Heel varus • Leg length discrepancy (> 5 mm)	

There are 5 grades of Maitland, they are as follows: -

Grade I

Small amplitude movement at the beginning of the available range of movement [8].

Grade I

Large amplitude movement at within the available range of movement.

Grade III

Large amplitude movement that moves into stiffness or muscle spasm.

Grade IV

Small amplitude movement stretching into stiffness or muscle spasm.

Grade V

A high velocity sudden thrust movement [9].

An Eccentric contraction

Is where the muscles lengthens whilst under relatively constant tension? It strengthens the tendon by laying down healthier collagen fibers. Three basics principles in an eccentric loading regime are as follows [10].

Length of tendon

If the tendon is pre-stretched, its resting length is increased, and there will be less strain on that tendon during movement [11].

Load

By progressively increasing the load exerted on the tendon, there should be a Resultant increase in inherent strength of the tendon [12].

Speed

By increasing the speed of contraction, a greater force will be developed l241

The most commonly used eccentric exercise for achilles tendinopathy is standing heel lowering for the achilles tendon, and the movements are typically performed to a 15-repetition maximum [13].

MATERIALS AND METHODS

Study Design

Comparative Study

Study Subjects

Diagnosed or referred case of Achilles tendinopathy of footballer.

Study Duration

04 Weeks

Participant preparation

30 patients conveniently selected from the population, who were fulfilling the selection criteria (inclusion & exclusion) for the study and were randomly divided into two equal group namely Group - A and Group-B, each containing 15 players.

Study Tools

Physical Tools:

Treatment Couch

Sufficient Pillow & Bed Sheet

Cotton Swab

Towel

Gloves

Masks

Consent form & Ethical Committee Clearance Form

Mulligan Belt

Statistical Tools

Pen

Paper and Pencil

Eraser

Laptop

Calculator

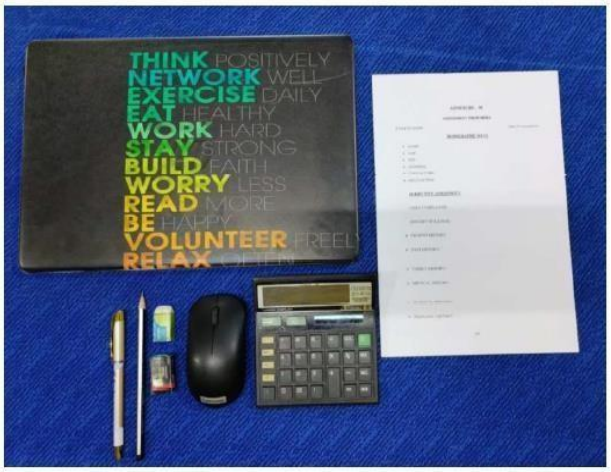
Assessment Chart

SPSS Software

Materials required

Figure 2: Physical Tools

Figure 3: Statistical Tools



Outcomes Measures

The Victorian Institute of Sports Assessment Achilles Questionnaire (VISA-A)

It was developed as a tool to evaluate the severity of Achilles tendinopathy (AT) and to facilitate comparison of the effect of different rehabilitation regimes regarding symptoms. Functions and activity in AT patients.

It is a very user friendly, as it takes less than five minutes to complete, even for patients with chronic and severe symptoms-

It is a valid, reliable and disease specific questionnaire to measure the condition of the Achilles tendon, but it is not a diagnostic tool.

It has eight (S) questions; covering three necessary domains

Pain

Functional status

Activity

In VISA-A, from questions 1 to 3 are related to pain; in this questionnaire "pain" refers specially to pain in the Achilles tendon region. From 4 to 6 are related to functions and questions 7 & 8 are related to activity. In questions 8. players should reply two of the questions-

Pain with activity

Duration of activity

The first seven questions have a score out of 10, and question 8 scores a maximum of 30.

Procedure for data collection

An ethical clearance for the study was obtained from the ethical committee of the Burdwan Institute of Medical and Life Sciences, Bardhhaman. In order to meet the purpose of the study a planned and careful procedure was chosen before proceeding further. In this study after screening with inclusion and exclusion criteria, detailed description and purpose of the study were mentioned verbally to patients and the patient who agreed to give their voluntary consent in written (content attached on Annexure I taken for the study. Finally. 30 patients were assigned for the study into two groups by convenient sampling technique. The patients were Convenient selected randomly allocated to Group A (n = 15) and Group B (n = 15).

The selected patient underwent the detailed assessment according to the assessment chart provided (Annexure Il) along with the parameters for study (The Victorian Institute of Sports

Assessment Achilles Questionnaire - Achilles)

Intervention

Treatment details

Procedure of Mulligan Mobilization

Ankle rocking technique

Patient position

Side lying with the affected leg up with hip and knee flexed.

Therapist Position

Sitting behind the patient's affected leg.

Hand Placement

Web spaces of both the hands are placed distal to the ankle joint, over the calcaneum behind, and tarsals in front.

Make sure that both the hands are placed distal to the malleolus.

Mobilization

Traction is applied by pulling the foot down, along the long axis of leg, with both the hands.

While traction is sustained, therapist performs ankle movements passively (i.e., plantar flexion, dorsiflexion, inversion, eversion, abduction and adduction) so as to increase ROM at the ankle joint complex.

3 sets of glides with repetition of 10 times in 3 days of a week; upto 4 weeks

Figure 4:

MWM for dorsiflexion
Patient Position
Supine lying position

Distal end of the tibia is stabilized on edge the plinth, while foot and malleolus are off the plinth for mobilization.

Towel is placed under the Tendo Achilles to maintain its contour for better stabilization and for comfort of the patient.

Therapist Position

Standing at foot end of the plinth facing the patient.

Hand Placement
One hand grasps the calcaneum from below

Other hand grasps the talus and the entire foot from above, using web space on talus and palm on forefoot.

Forearm should be vertically (along the treatment plane) above the talus.

Belt Placement

One end of the belt is looped around the foot of the patient, while the other end is given to the patient for the purpose of performing passive over pressure (dorsiflexion)

Mobilization

Therapist pulls the calcaneum down and concurrently pushes the talus from above to achieve a dorsal glide at talocrural joint.

While therapist sustains the glide, patient pulls the belt towards himself for gaining dorsiflexion.

Passive overpressure at the end of available range is applied by the patient by pulling it further and by the therapist's thigh/ groin.

3 sets of glides with repetition of 10 times in 3 days of a week; upto 4 weeks.
Precautions To Be Taken

Angle of forearm should be maintained vertically above the talus.

Hands should be placed such that palm of the hand touches the forefoot and not the malleolus.

Hands grasping the talus should lie inside the belt.

Forearm should be pronated to hold the talus properly.

Therapist's hands and forearm should move with the movement to sustain the glide

MWM for dorsiflexion
Patient Position

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Forearm should be pronated to hold the talus properly.

Therapist's hands and forearm should move with the movement to sustain the glide

Figure 5:

Procedure of Maitland mobilization
Talocrural Joint Long Axis Thrust Manipulation
Direction

Talocrural distraction is added, while simultaneously dorsiflexing the ankle. Ankle inversion and eversion is needed, as needed to increase the tissue resistance. A long axis thrust is performed.

Patient position

Patient is in supine lying.

Position of therapist's hand

Standing by the patients below the leg, therapist grasps the plantar aspect of the foot with his/her thumb, while grasping the talus with the ring finger.

3 sets of glides with repetition of 10 times in 3 days of a week; upto 4 weeks.

Figure 6:

Subtalar Joint Lateral Glide Mobilization
Direction

Stabilizes the distal tibia and fibula, the calcaneus distal to the talus, mobilization force perpendicular to the ground.

Patient position

Side lying on the involved side.

Position of therapist's hand

Therapist stabilizes the distal tibia and fibula with one hand. With the other hand, the therapist grasps the calcaneus, distal to the talus and provides a mobilization force perpendicular to the ground.

3 sets of glides with repetition of 10 times in 3 days of a week; upto 4 weeks.

Figure 7:

Procedure of ecentric exercise
Phase: 1
Step 1:

Stand on the step on the balls of the feet and keep the heels over the edge and both the knees in straight position.

Figure 8:

Step 2: Then lift the good leg off the ground.

Figure 9:

Step 3: Lower the heel down (affected side) below the step of the edge.

Figure 10:

Step 4 & 5: Put the good side onto step and use it to lift the painful side back to the level (same like starting position) and then go back to start.

Figure 11:

Figure 12:

Phase 2:

Step 6: Stand on the step on the balls of the feet and keep the heels over the edge and both the knees slightly bent.

Figure 13:

Step 7: Then lift the good leg off the ground.

Figure 14:

Step 8: Lower the heel down (affected side) below the step of the edge.

Figure 15:

Step 9 & 10: Put the good side onto step and use it to lift the painful side back up to the level starting position and then go back to the start.

Figure 16, 17:

Phase 1 - performed 15 times in a row then do phase 2 - performed 15 times in a row.
Repeat the above set of 30 exercises, in 3 times for each session (90 in total per session).

RESULTS

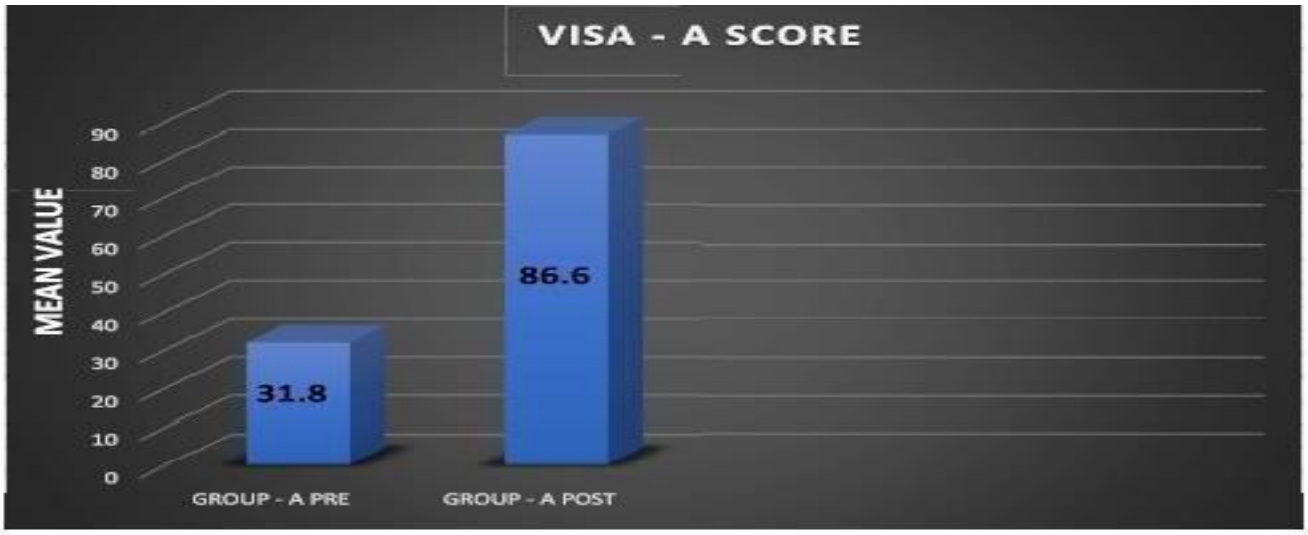
Graph 1: Comparison of pre-treatment visa- a between group – A and group - B

The graph shows pre-treatment scores of Group A and Group B of VISA – A mean score

Interpretation

Since p value 1.04578E - 17 is less than the level of significance ($p<0.05$), so we can reject the null hypothesis and accept the alternative hypothesis, that is the intervention given in Group-A participants (Mulligan mobilization along with Eccentric exercise) has resulted in significant increase in VISA-A.

Graph 2: Comparison of Post treatment visa- a between group – A snd group - B



Graph showing increasing VISA-A score of Group–A after 4th week of intervention

(Mulligan mobilization along with Eccentric exercise)

Interpretation

Since p value 9.00404E-13 is less than the level of significance (<0.05), so we can reject the null hypothesis and accept the alternative hypothesis, that is the intervention given in Group-B participants (Maitland mobilization along with Eccentric exercise) has resulted in significant increase in VISA-A scores.

Graph 3: Comparison of Pre and Post treatment visa- A Scores for Group B

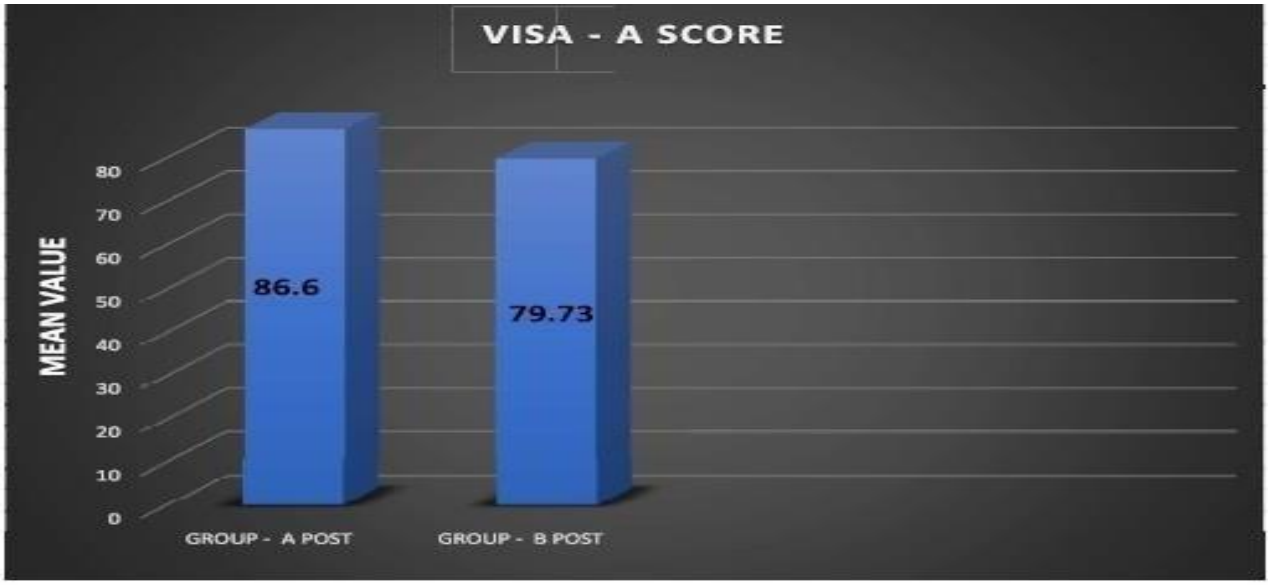
Graph showing increase VISA-A scores of Group–B after 4th week of intervention

(Maitland mobilization along with Eccentric exercise)

Interpretation

Since p value 9.00404E-13 is less than the level of significance (<0.05), so we can reject the null hypothesis and accept the alternative hypothesis, that is the intervention given in Group-B participants (Maitland mobilization along with Eccentric exercise) has resulted in significant increase in VISA-A scores.

Graph 3: Comparison of Post treatment visa- A Scores Between Group-A and Group - B



Graph shows VISA–A scores of Group A was significantly better than Group B

The mean score of VISA-A score improve from a mean 31.8 to 86.6 (p - 1.04578E-17) in Group A (Mulligan mobilization with Eccentric exercise) whereas in Group B (Maitland mobilization with Eccentric exercise) the mean is improve from mean 32.0667 to 79.733333

(p = 9.00404E-13). The pain score analysis for intergroup comparison shows significantly

Improvement in group A subjects as compared to group B (p = 0.000555828), thus indicating

Mulligan mobilization along with Eccentric exercise to be more effective towards pain reduction and increase functional activity. Although, intergroup analysis clearly depicts both interventions to be effective in pain relief and functional activity.

Hence, Mulligan mobilization along with Eccentric exercise has shown to be more effective in reducing pain & improvement in functional activity.

DISCUSSION

In this study an effort has been made to compare the effect of Mulligan Mobilization along with Eccentric exercise and Maitland Mobilization along with Eccentric exercise in patients with Achilles tendinopathy. A very few studies have compared Mulligan Mobilization along with Eccentric exercise and Maitland Mobilization along with Eccentric exercise in patients

having Achilles tendinopathy. This study was conducted to compare the effectiveness of Mulligan Mobilization versus Maitland Mobilization along with Eccentric exercise in Achilles tendinopathy. 30 patients were selected as per the preset criteria for this study who were assigned randomly into two groups. Group - A received Mulligan Mobilization along with Eccentric exercise whereas Group - B received Maitland Mobilization along with Eccentric exercise. Compliance was good among the patients who fulfilled intervention and there were no dropouts during the study. All the patients showed improvement after the corresponding intervention in both groups. However, Mulligan Mobilization along with eccentric exercise shower more improvement in pain reduction and increase in functional activity. VISA-A scale was chosen as the assessment tool in this study for measuring pain, functional status.

statistical analysis showed that the mean of VISA-A score in Group-A (Mulligan mobilization along with Eccentric exercise) is 31.8 before treatment and 86.6 after 4 weeks of treatment and Group-B (Maitland mobilization along with Eccentric exercise) it is 32.06667 before and 79.733333 after 4 weeks of treatment. Both groups showed significant increase in VISA-A score, but Group A showed better improvement than Group B. For Group A p-value of pretreatment and post treatment is p - 1.04578E-17 and Group B pre-treatment and post treatment.

p- Value is p = 9.00404E-13 and p-value of post treatment of Group A and Group B is p = 0.000555828.

The result of this comparative study demonstrated that there was more statistically significant improvement with

Group A than Group B treatment in patients with Achilles tendinopathy.

Although, both interventions result in reduction of pain & improvement in functional activity.

This study demonstrated a more significant reduction of pain & improvement in functional activity in Group A than Group B.

CONCLUSION

The results of this RCT demonstrate that Mulligan Mobilization with Eccentric Exercise was found to provide a superior benefit in terms of pain and functional activity via VISA-A (Pain, Functional status, Activity) when compared to a treatment regimen consisting of Maitland Mobilization with Eccentric Exercise over a period of four weeks in athletes in Achilles tendinopathy.

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