

High Velocity Thrust Manipulation with Conventional Treatment of Chronic Ankle Sprain

Abdul Rahim Zakaria* and Ashraf Ramadan Hafez**

*Assistant Professor of Faculty of Applied Medical Sciences, King Saud University.

**Assistant Professor of Faculty of Applied Medical Sciences, King Saud University.

ABSTRACT

Background and Purpose: Chronic ankle sprains are the most common complications encountered today. These complications manifested by prolonged and persist ankle pain, a high recurrence rate, limitation of range of motion and chronic instability of lateral ligaments underline the importance of careful diagnosis and treatment of ankle sprains. This study was conducted to evaluate the effect of high velocity thrust manipulation with conventional treatment of chronic ankle sprain of 2nd degree. **Subjects and Methods:** The study included 30 patients as a group with age ranged from 20 to 30 years (mean age 24.4 ± 2.65 years). They received conventional physical therapy in the form of passive stretching of tendoachillis with traction of calcaneus bone, strengthening exercises of muscles around the joint, ultrasonic therapy and deep friction massage, three treatment sessions per week for 3 weeks with high velocity thrust manipulation for two time of repetition, one at the beginning of first week and the other at the end of third week. Centre of gravity displacement was measured by oscillation surface on Satel. Universal goniometer is to detect range of motion (ROM) of ankle dorsiflexion and planterflexion. Pain severity was measured by visual analogue scale. Pre and post measures were done. **Results:** When pre and post treatment results were compared, There was a significant difference between pre and post measures, where mean difference in pain changed from (5.25 ± 0.85) to (2.86 ± 0.77) , ROM of dorsiflexion increased from (10.03 ± 1.29) to (14.56 ± 1.48) , ROM of planterflexion increased from (25.86 ± 6.34) to (33.27 ± 3.3) , in lateral displacement changed from $(1214.12 \pm 289.9 \text{ mm})$ to $(1045.25 \pm 202.29 \text{ mm})$, in anteroposterior displacement changed from $(1273.5 \pm 275.2 \text{ mm})$ to $(1251 \pm 189.77 \text{ mm})$. **Discussion and Conclusion:** This study showed that, high velocity thrust manipulation with conventional physical therapy is effective in treatment of 2nd degree of chronic ankle sprain patients.

Key words: ankle sprain, chronic ankle sprain, ankle instability, manipulation, mobilization, stretching exercises, thrust movement.

INTRODUCTION

An ankle sprain is the most common injury to the ankle, and the long term consequences of an ankle sprain is a common cause of chronic ankle pain. The most common type is the inversion ankle sprain, in which the ankle rolls over on the outside. An ankle sprain is the stretching and tearing of ligaments, in the sprained ankle the most common damage is done to the talo-fibular ligament (if the ankle sprain is worse, the calcaneo-fibular ligament can also be damaged^{11,16}).

Ankle sprains result from force around the ankle that exceeds the tensile limits of the supportive ligaments of the ankle mortice but is less than that which would break the ankle bones. Because the ankle joint is the dynamic link between the leg above and the foot planted on the earth below, it is the site of concentrated forces^{10,14}.

Sprains constitute 85% of all ankle injuries. Of these, 85% are inversion sprains. Up to one sixth of participation time lost from sports results from ankle sprains. Proper rehabilitation begins with accurate diagnosis because up to 40% of patients with untreated or misdiagnosed ankle injuries develop chronic symptoms^{2,5}.

Grades of ankle sprains are classified into 3 grades. Grade I sprains have a mild degree of swelling, and stretch has occurred to the ligamentous structures. Weight bearing is possible. Grade II sprains have a moderate degree of swelling and an incomplete tearing of ligamentous structures. Mild instability may be present, but a definite end point is present on ligamentous testing. Pain may be noted with weight bearing. Grade III sprains have severe swelling and are defined by at least 1 ligamentous structure being ruptured completely. Evidence of instability may be noted^{3,12,27}.

The most common type of ankle sprain is an inversion-type twist of the foot followed by pain and swelling. An individual with an ankle sprain can almost walk on the foot carefully with pain. The ability to walk on the foot usually excludes a fracture and indicates that a sprain has been experienced in an individual with normal local sensation and cerebral function. A person with a second degree ankle sprain often provides a history of pain and swelling^{13,17}.

To confirm the diagnosis, physical assessment is performed and based on history and to differentiate an ankle sprain from a fracture. A sprain is usually well defined by pain over the ligament that is sprained. Ankle motion is painful, and the ankle appears to be in the normal anatomic position. The skin is usually intact with local swelling and bruising in second degree ankle sprains. A positive anterior drawer sign finding on the injured ankle is evidence of anterior talofibular ankle ligament rupture^{20,23,25}.

The physical therapist treatment includes therapeutic modalities (eg, cryotherapy, electrical muscle stimulation) to speed the reduction of pain and swelling. As the patient progresses and is able to tolerate further therapy, the goals should be aimed at regaining full range of motion (ROM), strength, and stability of the ankle joint. The physical therapist also completes patient education throughout the rehabilitation process and establishes an appropriate home exercise program for each individual patient. The goal of the program should be to enable the patient to return to his/her previous level of activity. For less severe injuries, immediate protected ambulation should be encouraged, and physical therapy should emphasize return of ROM, strength, endurance, and proprioception^{6,22,26}.

The balancing function is to maintain the stability of the posture. The balance is obtained if the center of gravity of body plans within the base of support which is formed by the surface between the footprints of both feet on the ground when standing, from the surface of a single foot support monopodal, or even, the surface of the imprint of the forefoot to the ground in extreme situations as in the dance ballet^{22,26}.

This balance corresponds to the stability of the body. It requires the involvement of mechanisms that modulate the muscle tone to allow the postural adjustments. This complex regulation, which helps maintain balance despite changes in position or movement may be compromised in unusual situations generated, for example, by too much stimulation or during pathological conditions²⁶.

Assessment of balance occurs in recent years by the assessment carried out by the oscillations of the projection center of gravity of the body on the upper surface of a platform of strength and that is recorded by scanning the sampling position of center of foot pressure at a frequency of 40 Hz (Satel®). All his points are then assembled on a given surface which represents the value of the surface oscillation and the length of the journey made by the displacement of this point. It is accepted that the reduction of surface oscillation of center of gravity of the body reflects an increased balance as reducing the length of the journey²⁶.

The conventional physiotherapy aims to recover a painless ankle, articular amplitude compatible with normal function of the lower limb, resorption of edema and proprioception perfect.

The conventional physiotherapy include: Application of ultrasonic therapy which it would promote pain relief by reducing nerve conduction through deep heating effect between the planes of different layers under the skin. They ensure better tissue reconstruction by the transmission of vibratory waves that are vibrating each plan on a different frequency of its own and can, therefore, to break any adhesions due to trauma. Deep transverse massage with the possible painful tendon, this massage has analgesic effects and help in softening the adhesive tissues. Mobilizing exercises in form of traction of calcaneus bone and followed by passive stretching of tendoachillis^{4,8,9,21,31}.

Joint manipulation is characteristically associated with the production of an audible 'clicking' or 'popping' sound. This sound is believed to be the result of a phenomenon known as cavitation occurring within the synovial fluid of the joint. When a

manipulation is performed, the applied force separates the articular surfaces of a fully encapsulated synovial joint. This deforms the joint capsule and intra-articular tissues, which in turn creates a reduction in pressure within the joint cavity^{4,31}.

High velocity thrust, low amplitude manipulation, is one technique of manipulation involved in the treatment of chronic ankle sprain to release of entrapped synovial folds or plica, relaxation of hypertonic muscle by sudden stretching, disruption of articular or periarticular adhesions, and unbuckling of motion segments that have undergone disproportionate displacements. All of these will facilitate the range of motion of all movements of the ankle joint, and improve stability^{7,8,15,18,19,31}.

The aim of the current study is to evaluate the effect of conventional physiotherapy with high velocity thrust, low amplitude manipulation in treatment of chronic ankle sprain.

MATERIALS AND METHODS

Subjects

All subjects were grade II of ankle sprain. The study included 30 volunteer patients, age ranged from 20 to 30 years with mean age 24.4 ± 2.65 years followed a conventional physical therapy program of exercises in the form of deep friction massage around the lateral aspect of the ankle joint locally on lateral collateral ligaments, ultrasonic therapy on lateral collateral ligaments, mobilizing exercise in the form of traction of calcaneus bone and followed by passive stretching of tendoachillis, three sessions per week for 3 weeks, with High velocity thrust, low amplitude manipulation, one repetition at beginning of the first week and second repetition at the end of third week²⁶. All the patients were listed at out clinic in king khaled university hospitals. All of them were suffering from pain, swelling, and limitation of ROM of ankle joint with instability.

Instrumentations

1- Visual analogue scale (VAS) is to measure the pain severity.

- 2- Universal goniometer is to detect range of motion (ROM) of ankle dorsiflexion, and planterflexion.
- 3- Platform Satel® (stabilometry Static measures)²⁶, to measure balance by measuring the centre of gravity displacement via oscillation surface by satel. (anteroposterior and lateral displacement).

Procedures

The patients signed an informed consent form, and were informed about the whole procedures before testing and training:

Treatment procedures:

The conventional physical therapy program which was in the form of: Deep friction massage (5 minutes around the lateral aspect of the ankle joint locally on lateral collateral ligaments by thumb deep friction massage), ultrasonic therapy (3 minutes, 1.5 w/sec^2 in continuous mode on lateral collateral ligaments), mobilizing exercise in the form of traction of calcaneus bone and followed by passive stretching of tendoachillis (stretching exercise for planterflexors (from long sitting with one hand fixing the knee and the other hand stretches the planterflexor muscles, 5 repetitions, 30 seconds in position of stretching, 30 seconds in position of relaxation), and strengthening exercises of dorsiflexion (from sitting position and ask the patient to move the foot towards the body with moderate resistance, 10 repetitions with 3 sets, 6 seconds rest between each repetition, and 1 minute rest between the sets). Strengthening exercises of planterflexion (from prone lying position with foot outside the bed and ask the patient to move the foot away from the body with moderate resistance, 10 repetitions with 3 sets, 6 seconds rest between each repetition, and 1 minute rest between the sets). Strengthening exercises of eversion (from sitting position and ask the patient to rotate the foot outward the body with moderate resistance, 10 repetitions with 3 sets, 6 seconds rest between each repetition, and 1 minute rest between the sets). Strengthening exercises of inversion (from sitting position and ask the patient to rotate the foot inward the body with moderate resistance, 10 repetitions with 3 sets,

6 seconds rest between each repetition, and 1 minute rest between the sets), three sessions per week for 3 weeks, with High velocity thrust, low amplitude manipulation, one repetition at beginning of the first week (by fixing the tibia by one hand and the other cupping the talus and manipulate the talus from the tibia downward during gliding movement with High velocity thrust, low amplitude movement), and second repetition at the end of third week.

The program continued for 3 weeks, 3 sessions per week performed and supervised by the same physical therapist.

Assessment procedures:

All the patients were assessed before treatment and reassessed after 3 weeks by:

- 1- Platform SATEL ® (stabilometry Static measures)²⁶, to measure balance by measuring the centre of gravity displacement via oscillation surface by satel. (anteroposterior displacement and lateral displacement. Asking the patient to stand on platform on the affected ankle and try keep balance as much as possible for at least 50 seconds²⁶ and record the centre of gravity oscillation through anteroposterior displacement and lateral displacement.
- 2- Universal goniometer is to detect range of motion (ROM) of ankle dorsiflexion and planterflexion. Patients was sitting on bed with extended of the lower limb. The fixed arm of the goniometer is placed in parallel

to the tibia and the movable arm in parallel to the foot then the subjects were asked to dorsiflex and planterflex and record the angle of dorsiflexion and planterflexion.

- 3- Visual analogue scale (VAS) is to measure the pain which is represented from (0) grade to (10) grade. Zero grade means no pain, (10) grade means unbearable pain, from 1 to 10 means graduation intensities of pain. The subjects were asked to indicate the level of pain by placing a dash at the appropriate level on the 10 cm horizontal line.

Data Analysis

The collected data were statistically treated and the following values were found minimum, maximum, mean, S.D., one sample paired t-test to compare between pre and post in the group, at a confidence level of (P = 0.05).

RESULTS

There was a significant improvement of pain after conventional physical therapy program with High velocity thrust, low amplitude manipulation, from (5.25±0.85) to (2.86±0.77), ROM of dorsiflexion increased from (10.03±1.29) to (14.56±1.48), ROM of planterflexion increased from (25.86±6.34) to (33.27±3.3), tab. (1) fig. (1).

Table (1): Pre and post values of pain, ROM of dorsiflexion, ROM of planterflexion.

	Pain		ROM of dorsiflexion		ROM of planterflexion	
	Pre	Post	Pre	Post	Pre	Post
Min	4	2	8	13	17	26
Max	6	4	13	18	32	38
Mean	5.25	2.86	10.03	14.56	25.86	33.27
SD	0.85	0.77	1.29	1.48	6.34	3.3
t- test	0.007		0.009		0.007	

(*) significant, P ≤ 0.05

(**) no significant, P ≥ 0.05

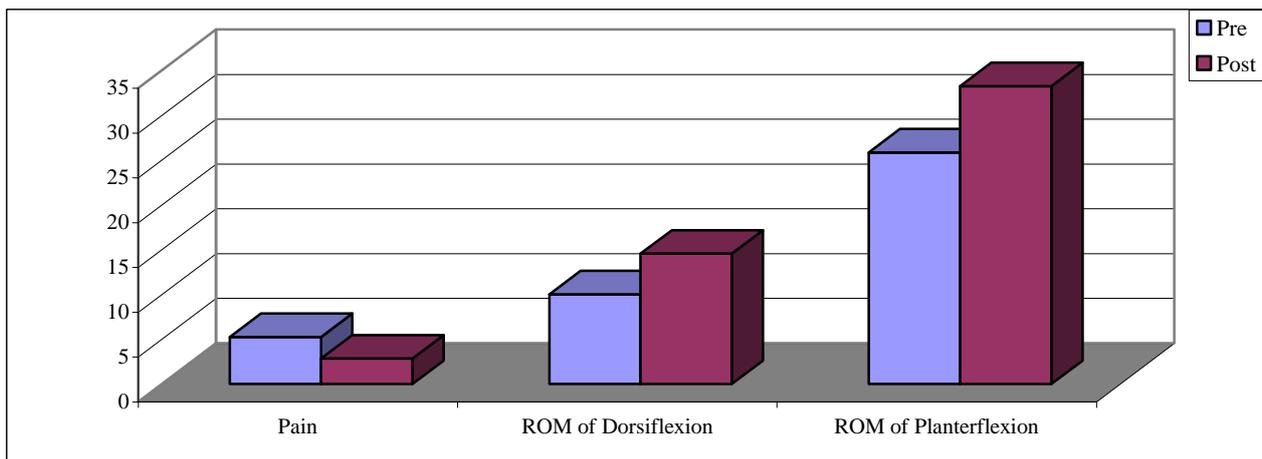


Fig. (1): The mean values of pain, ROM of dorsiflexion, ROM of planterflexion.

In anteroposterior displacement changed from (1273.5±275.2 mm) to (1251±189.77 mm), lateral displacement changed from (1214.12±289.9 mm) to (1045.25±202.29 mm), in tab. (2) fig. (2).

Table (2): Pre and post values of anteroposterior displacement and lateral displacement.

	Anteroposterior displacement		Lateral displacement	
	Pre	Post	Pre	Post
Min	1253	1223	1195	1002
Max	1325	1278	1455	1185
Mean	1273.5	1251	1214.12	1045.25
SD	275.2	189.77	289.9	202.29
t- test	0.035		0.036	

(*) significant, P ≤ 0.05

(**) no significant, P ≥ 0.05

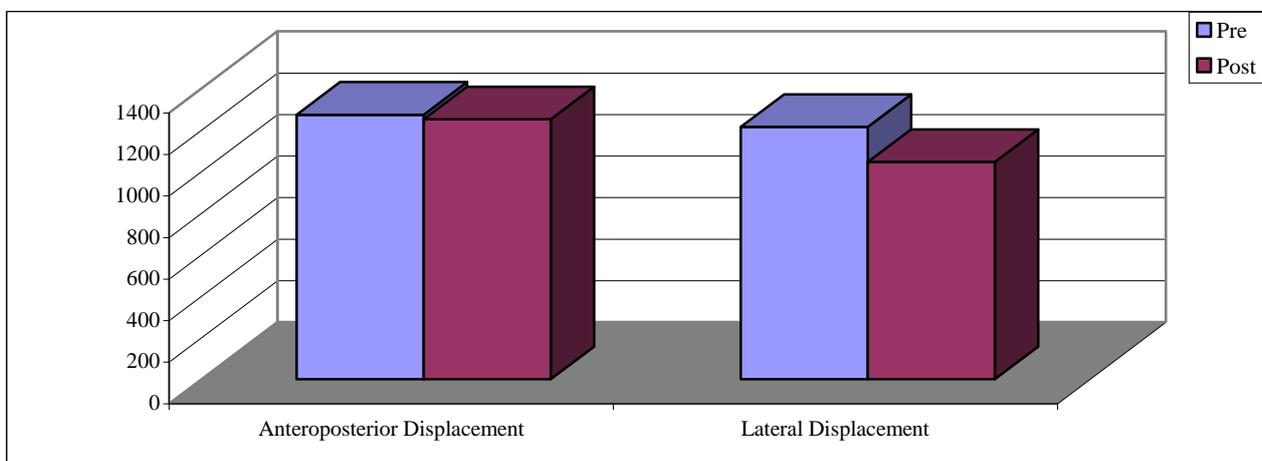


Fig. (2): The mean values of anteroposterior displacement and lateral displacement.

DISCUSSION

This study assessed the immediate effects of high velocity thrust manipulation with conventional treatment of chronic grade II ankle sprain.

The pain following ankle sprains or instability after recurrent sprains, are factors limiting athletic performance and active daily living. The patient needs a perfectly painless support under the load of body weight increased by movements^{28,29}.

The results of this study showed that there was a significant improvement of pain, and ROM of dorsiflexion and planterflexion range of motion due to using of exercise program which include: ultrasonic therapy can relax the tense soft-tissues through its micromassage effect, leading to softening of the hard tissues and allow more range of motion. Stretching exercise which decreasing spasm of the muscles and lengthening the shorted muscles which restricting the wide range of motion and leading to instability of the ankle joint³⁰.

Strengthening of muscles is improving ROM and function of dorsiflexion, planterflexion, eversion, and inversion of the ankle joint which is considered the walls of the ankle and must be strong enough to protect the joint²⁴.

Stretching exercises also improving the circulation which decrease the concentration of metabolites which is the main cause of pain^{7,8}.

Deep friction massage which produces therapeutic movement by breaking down the strong cross links or adhesions that have been formed, softening the scar tissue and mobilising the cross links between the mutual collagen fibres and the adhesions between repairing connective tissue and surrounding tissues, and also modulates of the nociceptive impulses at the level of the spinal cord: the "gate control theory". The centripetal projection into the dorsal horn of the spinal cord from the nociceptive receptor system is inhibited by the concurrent activity of the mechanoreceptors located in the same tissues, leads to increased destruction of pain provoking metabolites, such as Lewis's substances. This metabolite, if present in too

high a concentration, causes ischaemia and pain^{5,7,8,26}.

The application of high velocity thrust manipulation, as compared with placebo manipulation, in athletic patients with grade II ankle sprain redistributed the load supports at the level of the foot^{26,31,32}.

Improving ROM and function of the muscles and joint state were creating a controlling and balancing between agonist and antagonist muscles of the ankle region and coordination of the movements^{1,4,33,34}.

The balancing and stability of the ankle joint improved through decreasing the oscillation of center of gravity of the body on the upper surface of a platform. The balance is obtained if the center of gravity of body plans within the base of support and not oscillate outside the base of support, and also when the anteroposterior and lateral displacement decreased^{22,26}.

The oscillations of the center of gravity of the body on the upper surface of a platform of strength and that is recorded by scanning the sampling position of center of foot pressure at a frequency of 40 Hz (Satel ®). The value of the surface oscillation and the length of the journey of oscillations represent the anteroposterior and lateral displacement of center of gravity of the body. It is accepted that the reduction of surface oscillation of center of gravity of the body reflects an increased balance as reducing the length of the journey²⁶.

Conventional physical therapy program with high velocity thrust manipulation was improving the stability of the ankle joint through reduction of oscillation of centre of gravity on platform³¹.

The results of this study showed that, there was a significant results of the program for pain and ROM of dorsiflexion and planterflexion due to using of exercises program in the form of traction with stretching exercise of tendoachillis with high velocity thrust manipulation^{24,35}.

From all of the above, we showed that conventional physical therapy program with high velocity thrust manipulation are more beneficial in treatment of chronic ankle sprains.

Conclusion

This study suggested that a conventional physical therapy program with high velocity thrust manipulation is effective in treatment of chronic ankle sprains and help to return the stability of ankle joint.

REFERENCES

- 1- Arnold, B.L. and Docherty, C.L.: Bracing and rehabilitation--what's new. *Clin Sports Med.* 23(1): 83-95, 2004.
- 2- Baker, J.M. and Ouzounian, T.J.: Complex ankle instability. *Foot Ankle Clin*, Dec; 5(4): 887-896, 2000.
- 3- Beynnon, B.D., Renstrom, P.A. and Alosa, D.M.: Ankle ligament injury risk factors: a prospective study of college athletes. *J Orthop Res*, Mar; 19(2): 213-220, 2001.
- 4- Brodeur R.: "The audible release associated with joint manipulation.". *J Manipulative Physiol Ther* 18 (3): 155-64, 1995.
- 5- Eiff, M.P., Allen, T.S. and Gary, E.S.: Early Mobilization Versus Immobilization in the Treatment of Lateral Ankle Sprains. *J. Amr Sports Medicine*, 22(1): 83-88, 1994.
- 6- Feiler, S. and Frank, M.: [Pattern of injuries and risk of injury in skateboarding]. *Sportverletz Sportschaden*, Jun; 14(2): 59-64, 2000.
- 7- Grabiner, M.D.: Altered ankle joint proprioception in subjects suffering recurrent ankle sprains. *Med Sci Sports Exerc*, Jun; 32(6): 1185-1187, 2000.
- 8- Hansen, M.L., Otis, J.C., Kenneally, S.M. and Deland, J.T.: A closed loop foot and ankle loading model., *J Biomechanics*. 34: 551-555, 2001.
- 9- Hubbard, T.J. and Denegar, C.R.: Does Cryotherapy Improve Outcomes With Soft Tissue Injury?. *J Athl Train*, 9; 39(3): 278-279, 2004.
- 10- Klein, P. and Sommerfeld, P.: *Biomechanics of the lower limbs. Foundations and concepts, pelvis, lower limbs.* 2nd edition. Elsevier. Paris. 2008.
- 11- Kannus, P. and Renstrom, P.: Treatment for acute tears of the lateral ligaments of the ankle. Operation, cast, or early controlled mobilization. *J Bone Joint Surg Am*, Feb; 73(2): 305-312, 1991.
- 12- Kibler, W.B.: *Rehabilitation of the ankle and foot. Functional Rehabilitation of Sports and Musculoskeletal Injuries.* Aspen Publishers Inc: 273-279, 1998.
- 13- LeBlanc, K.E.: Ankle problems masquerading as sprains. *Prim Care*, Dec; 31(4): 1055-1067, 2004.
- 14- Liu, S.H. and Nguyen, T.M.: Ankle sprains and other soft tissue injuries. *Curr Opin Rheumatol*. Mar; 11(2): 132-137, 1999.
- 15- Maigne, J.Y. Vautravers: Mechanism of action of spinal manipulative therapy. *Joint Bone Spine*. Sep; 70(5): 336-341, 2003.
- 16- Man, I.O. and Morrissey, M.C.: Relationship between ankle-foot swelling and self-assessed function after ankle sprain. *Med Sci Sports Exerc*, Mar; 37(3): 360-363, 2005.
- 17- Mattacola, C.G. and Dwyer, M.K.: Rehabilitation of the Ankle After Acute Sprain or Chronic Instability, *J Athl Train*. 2002 Dec; 37(4): 413-429, 2002.
- 18- Nussbaum, E.D., Hosea, T.M. and Sieler, S.D.: Prospective evaluation of syndesmotic ankle sprains without diastasis. *Am J Sports Med*, Jan-Feb; 29(1): 31-35, 2001.
- 19- Osborne, M.D. and Rizzo, T.D. Jr.: Prevention and treatment of ankle sprain in athletes. *Sports Med*; 33(15): 1145-1150, 2003.
- 20- Philbin, T. and Donley, B.G.: When do you X-ray ankle sprains in patients with acute ankle injuries? *Cleve Clin J Med*, Jun; 67(6): 405-406, 455, 2000.
- 21- Proske, U.W.E.: What is the role of muscle receptors in proprioception? *Muscle Nerve* 31: 780-787, 2005.
- 22- Puglia, M.L., Middel, C.J. and Seward, S.W.: Comparison of acute swelling and function in subjects with lateral ankle injury. *J Orthop Sports Phys Ther*, Jul; 31(7): 384-388, 2001.
- 23- Refshauge, K.M., Kilbreath, S.L. and Raymond, J.: Deficits in detection of inversion and eversion movements among subjects with recurrent ankle sprains. *J Orthop Sports Phys Ther*, Apr; 33(4): 166-173; discussion 173-176, 2003.
- 24- Renstrom, P.A.F.H. and Kannus, P.: Injuries to the foot and ankle. *Orthop Sports Med*; 1705-1767, 1994.
- 25- Renstrom, P.A. and Konradsen, L.: Ankle ligament injuries. *Br J Sports Med*, Mar; 31(1): 11-20, 1997.
- 26- Sandra López-Rodríguez, César Fernández de las-Peñas, Francisco Alburquerque-Sendín, Cleofás Rodríguez-Blanco, Luis Palomeque-del-Cerro Immediate Effects of Manipulation of the Talocrural Joint on Stabilometry and Baropodometry in Patients With Ankle Sprain, *Journal of Manipulative and Physiological Therapeutics*, Volume 30, Issue 3, March, Pages 186-192, 2007.

- 27- Specchiulli, F. and Cofano, R.E.: A comparison of surgical and conservative treatment in ankle ligament tears. *Orthopedics*, Jul; 24(7): 686-688, 2001.
- 28- Stasinopoulos, D.: Comparison of three preventive methods in order to reduce the incidence of ankle inversion sprains among female volleyball players. *Br J Sports Med*. Apr; 38(2): 182-185, 2004.
- 29- Trevino, S.G., Davis, P. and Hecht, P.J.: Management of acute and chronic lateral ligament injuries of the ankle. *Orthop Clin North Am*, Jan; 25(1): 1-16, 1994.
- 30- Westlake K.P., Y. Wu, Culham: Sensory - specific balance training in older adults: Effect on position, movement, and velocity sense at the ankle. *Physical Therapy*. 87: 560-568. 2007.
- 31- Whitman J.M., Childs J.D., Walker V.: The use of manipulation in a patient with an ankle sprain injury not responding to conventional management: a case report. *Manual Therapy* 10 224 - 231. 2005.
- 32- Willems, T., Witvrouw, E., Verstuyft, J., Vaes, P. and De Clercq, D.: Proprioception and Muscle Strength in Subjects With a History of Ankle Sprains and Chronic Instability, *J Athl Train.*, 37(4): 487-493, 2002.
- 33- Wolfe, M.W., Uhl, T.L. and Mattacola, C.G.: Management of ankle sprains. *Am Fam Physician*, Jan 1; 63(1): 93-104, 2001.
- 34- Wright, I.C., Neptune, R.R. and van den Bogert, A.J.: The effects of ankle compliance and flexibility on ankle sprains. *Med Sci Sports Exerc*, Feb; 32(2): 260-265, 2000.
- 35- Zoch, C., Fialka-Moser, V. and Quittan, M.: Rehabilitation of ligamentous ankle injuries: a review of recent studies, *Br J Sports Med.*, 37(4): 291-295, 2003.

المخلص العربي

اقتحام التلاعب عالي السرعة مع العلاج الطبيعي التقليدي لعلاج التواء الكاحل المزمن

الهدف من هذه الدراسة تقييم مدى تأثير برنامج العلاج الطبيعي المتمثل في عمل وسائل العلاج التقليدية والطريقة عالية السرعة في الحالات المزمنة لالتواء الكاحل تشمل الدراسة ثلاثون مريضاً من الذكور تتراوح أعمارهم من عشرون إلى ثلاثون سنة. بعد أن تم تشخيص المرضى إكلينيكيًا : المجموعة خضعت لبرنامج وسائل العلاج التقليدية المتمثل في عمل شد لوتر اكيليس مع شد عظمة الكاحل وتمارين لتقوية عضلات ثنى وفرد والانحناء الداخلي والخارجي لمفصل الكاحل ، وتدليك عميق على الرباط الخارجي للكاحل و موجات صوتية لمدة ثلاثة أسابيع ثلاث مرات أسبوعياً، بالإضافة إلى الطريقة عالية السرعة مرتان ، مرة واحدة في أول الأسبوع الأول ومرة أخرى في آخر الأسبوع الثالث ، نفس البرنامج بنفس الأخصائي لكل المرضى . تم تقييم الألم بالمدى البصري للألم والمدى الحركي لثنى وفرد المفصل بمقياس المدى الحركي للمفصل وإزاحة مركز الجاذبية بمقياس الاهتزاز السطحي لساتل ومقياسه بالمليمتر . وقد بينت النتائج الإحصائية وجود تحسن ملحوظ في الألم والمدى الحركي للمفصل وإزاحة مركز الجاذبية ووجود فرق ذات دلالة إحصائية بينهما . وقد ظهر من الدراسة أن برنامج العلاج الطبيعي المتمثل في عمل وسائل العلاج التقليدية والطريقة عالية السرعة ذو تأثير فعال لعلاج الحالات المزمنة لالتواء الكاحل .