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[ORIGINAL REPORT]

Immediate Effect of Positional Release Therapy VS Ischemic Compression Therapy for Gastrocnemius Latent Trigger Point to Reduce Pain and Improve Active Ankle Dorsiflexion in Football Players: A Comparative Study

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ABSTRACT

Background: Football is a moderate contact sport. Correspondence to FIFA world cup survey, the injuries most frequently affected was lower extremity (65.4%). Maximum injured site was found to be the calf (29.62%). Latent MTP's are those that are clinically dormant with regards to spontaneous pain and pains only on palpation. Ischemic Compression is the application of progressively strong, painful pressure on trigger point to eliminate the trigger point. On performing ischemic compression, tissue attains recovery by reperfusion thereby relieving transient blood flow occlusion. PRT is indirect and passive treatment also known as strain counter strain therapy which positions the muscle in position of comfort for a period (POC) for 90 seconds while maintaining a sustained manual pressure. Both techniques have been proven to improve pain and ROM

Methodology: 38 individuals of 18-30 years having latent trigger point in gastrocnemius were randomly divided between 2 groups included in the study and single intervention of PRT to group A and ICT to group B was given. Pain and Ankle Dorsiflexion was measured pre and post intervention using VAS and weight bearing lunge test respectively.

Results: A significant difference was found in both the groups. In PRT VAS score pre intervention was 6.52 and post was 5.39 with p=0.00002, WBLT pre intervention was 14.91 and post was 15.73 with p=0.025. in ICT VAS score pre intervention was 6.558 and post was 5.547 with p=0.00001, WBLT pre intervention was 14.368 and post was 14.900 with p=0.048. A non-significant difference was found between both the groups, for pain VAS score p= 0.227 for ankle dorsiflexion WBLT score p= 0.228

Conclusion: There was no statistically significant difference between PRT and ICT and both treatments showed significant improvement in pain and ankle dorsiflexion equally.

Keywords: *Ischemic compression Technique (ICT), gastrocnemius, latent trigger points, Positional Release Therapy (PRT).*

Introduction

Sport is defined as a subset of exercises undertaken individually or as a part of a team, where participants have a define goals.[1] Sports is mainly classified into contact, limited-contact, or non-contact sports. Further this categorization subdivides contact sports into collision sports and contact sports. Even in non-contact sports e.g. power lifting in which contact is rare and unexpected, rate of serious injuries is highly prevalent.[2] Football is a sport which require high levels of physical fitness which include speed, agility, strength, power and endurance.[3] It is a moderate contact sport, which includes rough play and hence increased exposure to injury.[4] With correspondence to the 2014 FIFA world cup survey, the injuries most frequently affected was the lower extremity (65.4%) followed by the head/neck (18.3%), upper extremity (9.6%) and the trunk (6.7%).[5] Footballers face major issues due to

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muscle pain which is reported to represent 20% to 37% of all time-loss injuries at men's professional level and 18% to 23% at men's amateur level.[6] Maximum injured site in footballers was found to be the region around the calf (29.62%) followed by knee (17.59%), shoulder (13.88%), groin (7.40%), hamstring (5.55%), Hand (3.70%), and others (12.96%).[7] There are two identified risk factors which cause muscle injuries in footballers - intrinsic and extrinsic factors.[8] Identified intrinsic risk factors encompasses joint flexibility including pathological ligamentous laxity and muscle tightness, functional instability, past injuries and insufficient rehabilitation. Extrinsic risk factors in accounts for the exercise load in football (competition and practice), inadequate equipment (Shin guards, taping, shoes), playing field conditions and foul play. [8,9]

Myofascial trigger point (MTP`s) is defined as a hyperirritable spot in the skeletal muscle and that is associated with a hypersensitive palpable nodule in a taut band of muscle.[10] On Compression, the point is tender and tends to refer to a distance termed as referred pain associated with motor dysfunction. Active trigger point causes clinical pain symptom, which usually weakens the muscle and gives rise to referred pain on compression within pain pressure tolerance. Latent MTP's are those that are clinically dormant with regards to spontaneous pain and pains only on palpation. Latent MTP's has similar characteristics of active MTP's[10,11]. A Myofascial trigger point that is closely associated with dysfunctional endplates is identified as central MTP`s. These central MTP`s are usually situated near the centre of muscle fibres. A key MTP`s are those that are responsible for activating one or more satellite MTP`s. The factors influencing Myofascial trigger points include micro trauma, macro trauma, overuse, physical stress and emotional stress. The Patho-physiology of its origin is not clear yet and some recent research suggests that there is less oxygen and nutrition in injured/overused muscle fibres leading to involuntary muscle contractions.[11] Trigger point release is the method of releasing muscle tension by inactivating the trigger points that are causing the taut bands in muscle. Calf muscle pain is generally regarded as common injuries in athletes. In One of the studies on football players, calf pain represented 3.6% of injuries over a 5-year period.[13] Muscle pain (gastrocnemius and soleus), contusion, cramp, referred pain from the lumbar spine and delayed onset muscle soreness (DOMS) are common potential causes of calf pain. The symptoms for plantar flexors MTP's include nocturnal night cramps, include referred heel and restricted ankle dorsiflexion ROM[10]. Trigger points are clinically classified as: Active: Active trigger points are those that may be responsible for the presenting pain complaint. They may also be associated with less readily definable symptoms such as weakness, paraesthesia, or temperature changes, and they may have associated referred pain. Latent: Latent trigger points present with muscle shortening, and pain occurs only on the application of external pressure. These trigger points may become activated by a variety of stimuli, including poor posture, overuse, or muscle imbalance.[14,15] Icing or cryotherapy is advised to the patients presenting with musculoskeletal injury. Cryotherapy causes vasoconstriction and decreases tissue blood flow, reduces tissue metabolism, oxygen utilization, inflammation and muscle spasm. Other manual therapies such as Muscle Energy Technique (MET), Cyriax, Myofascial Release (MFR), ischemic compression technique (ICT) and modalities namely Ultrasound, Strong Surged Faradic (SSF), Dry Needling can be used to treat MTP's. [15]

Positional release technique is a method of total body evaluation and treatment tender points and a position of comfort to resolve the associated function.[16] Another name for Positional Release technique (PRT) is strain counterstrain therapy. It is a manual therapy in which the flexibility of muscle is increased by keeping the muscle in a shortened position for further muscle relaxation. In PRT the muscle is kept in position of comfort for a period of 90 seconds while maintaining a sustained manual pressure on trigger point to eliminate it.[17] PRT is an indirect and passive treatment accomplished by placing the involved tissues in an ideal position of comfort (POC). It acts on the muscle spindle and is associated with the reflex mechanism which controls the muscle spasm. As a result of treatment using PRT, there is a decrease in muscle tension, facial tension, and joint hypo-mobility. These changes thus result in a significant increase in functional range of motion and decrease in pain.[18]

Ischemic Compression is the application of progressively strong, painful pressure on trigger point to eliminate the trigger point. On performing ischemic compression, tissue attains recovery by

reperfusion thereby relieving transient blood flow occlusion. Ischemic compression should be followed by lengthening of muscle. Ischemic compression is performed by compressing the trigger points with tolerable pain intensity using thumb pressure and as the degree of pain decreases the intensity of compression is increased simultaneously. Ischemic compression should be followed by lengthening of muscle[19]

In contact sports like football pain and muscle tightness has been identified as a high-risk factor especially in lower extremities, which affects their performance as the players use the lower limbs to kick the ball, jump and run as well. It is evident that repetitive overloading of muscle coupled with muscle strain give rise to formation of trigger points which are painful which results in decreased ROM of joints. MTrp`s in gastrocnemius affects active ankle dorsiflexion. Both PRT and ICT are effective in reducing pain and improving ROM, their comparison will help understanding which intervention will give better results and can be used as first line of intervention for the players or whether can be used to expect the same outcome keeping in mind the ease with which interventions can be given.

Materials And Methodology

After taking ethical clearance a comparative study was conducted on 38 football players having latent trigger point in gastrocnemius muscle who were recruited from different football clubs in Pune using convenient sampling. After screening for inclusion and exclusion criteria players were randomly divided into Group A (Positional release therapy) and Group B (Ischemic compression therapy). Outcome measure was visual analogue scale for pain and weight bearing lunge test for ankle DF which was taken at baseline and immediately after treatment. Following was the inclusion criteria: Age group was 18-30 years with playing hours 2 hours a day, pain on palpation, pain during palpation of muscle trigger point with 2.5kg/cm2 pressure with pressure algometer and fulfilling the diagnostic criteria i.e. Simon's criteria - presence of palpable taut band in skeletal muscle, presence of hypersensitive tender spot in the taut band, local twitch response elicited by snapping palpation of taut band, reproduction of referred pain pattern in response to compression. Any player having active trigger points, congenital deformity of the foot and ankle, recent lower limb fractures and surgeries, peripheral vascular disease and recent injuries to the foot or ankle were excluded from the study.

Procedure

Group A: Positional Release Therapy: The subject was in a prone lying position. The therapist palpates for the trigger points using the pressure algometer standing on the side of the tender point. The therapist flexed the knee to 90o and plantar-flexed the ankle by pressing the calcaneus cephalad towards the tender point while simultaneously applying pressure on the trigger point. Internal rotation of the tibia was used to fine tune the position. This position was held for 90 seconds and repeated thrice.

Group B- Ischemic Compression Therapy: The subject was positioned prone with the leg extended for MTPr release on the gastrocnemius. The therapist palpates for the trigger points using a pressure algometer. The therapist slowly apply increased thumb pressure on the gastrocnemius MTPr until the first increase in tissue resistance is felt (barrier). Pressure will be perceived as tender/painful. Pressure was maintained until a release in muscle tension or the participant felt no tenderness/pain only thumb pressure. On releasing the pressure the therapist applied a passive stretch to the affected calf muscle, to facilitate maintenance of the gained muscle length. This position was held for 90 seconds and repeated thrice.

Fig. 1: Position for Giving PRT

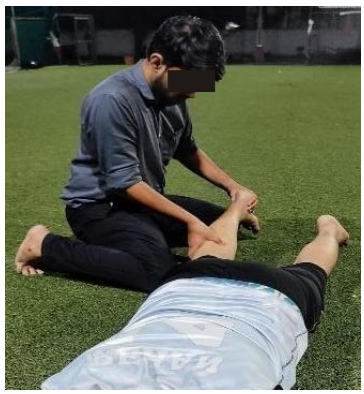


Fig. 2 : Position for Giving ICT

Fig. 3 : Weight Bearing Lunge Test

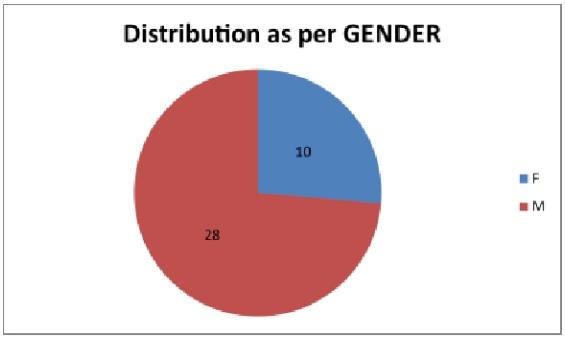
Statistical Analysis

Data obtained was compiled on a MS Office Excel Sheet (v 2019, Microsoft Redmond Campus, Redmond, Washington, United States).

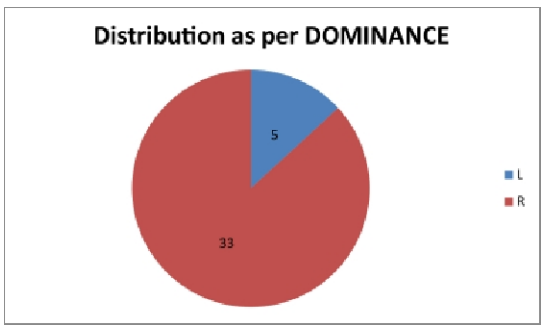
Data was subjected to statistical analysis using the Statistical package for social sciences (SPSS v 26.0, IBM).The data collected pre and post intervention was subjected to the following text.

1. Intra group analysis was done using paired t-test to compare the effects of treatment in both the groups.
2. Inter group analysis was done using unpaired t test to compare the effects of both the treatment.

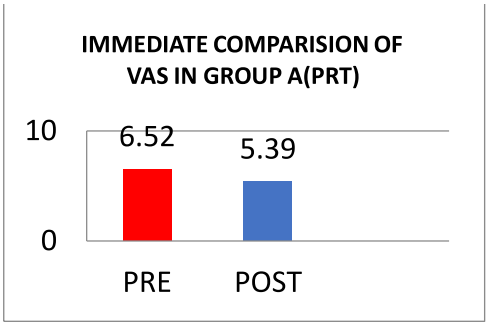
Result



Graph 1: Distribution as per gender



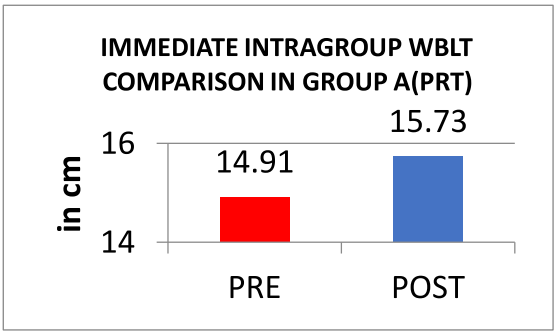
Graph 2: Distribution as per dominance



Graph 3: VAS immediate comparison within Group A

Table 3: VAS immediate comparison within Group A

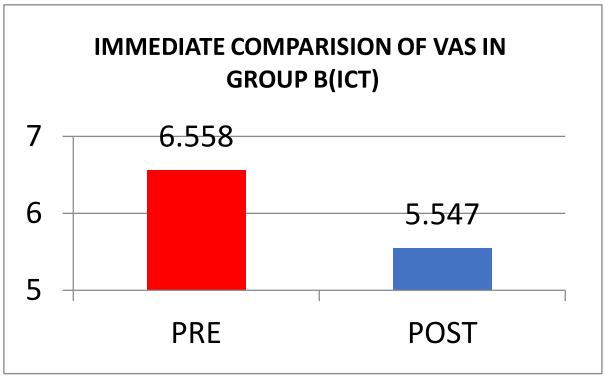
Outcome	Mean	Standard Deviation	P Value
PRE	6.52	.655	0.00002
POST	5.39	1.034	



Graph 4: Immediate intragroup WBLT comparison in group A

Table 4: Immediate intragroup WBLT comparison in group A

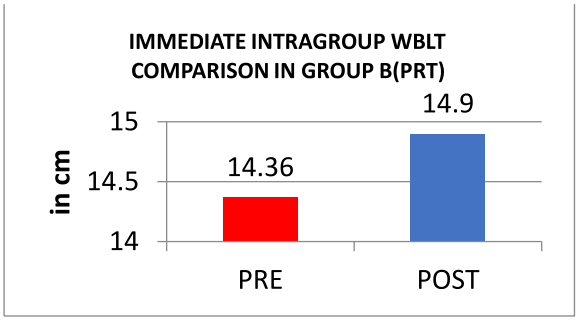
Outcome	Mean	Standard Deviation	P Value
PRE	14.91	1.555	0.025
POST	15.73	1.547	



Graph 5 : Immediate comparison of VAS in group B

Table 5: Immediate comparison of VAS in group B

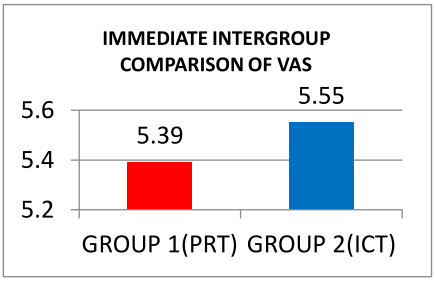
Outcome	Mean	Standard Deviation	P Value
PRE	6.558	.7404	0.0001
POST	5.547	1.0543	



Graph 6: Immediate intragroup WBLT comparison in group B

Table 6: Immediate intragroup WBLT comparison in group B

Outcome	Mean	Standard Deviation	P Value
PRE	14.368	1.2597	0.048
POST	14.900	1.3034	



Graph 7: Immediate intergroup comparison of VAS

Table 7: Immediate intergroup comparison of VAS

Group	Mean	Standard Deviation	P Value
Group A(PRT)	5.39	1.034	0.227
Group B(ICT)	5.55	1.054	

Graph 8 : Immediate intergroup comparison of WBLT

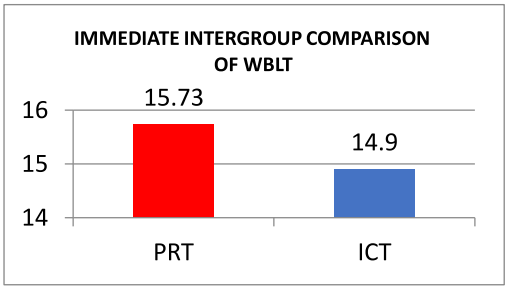


Table 8: Immediate intergroup comparison of WBLT

Group	Mean	Standard Deviation	P Value
Group A(PRT)	15.732	1.5467	0.228
Group B(ICT)	14.900	1.3034	

Discussion

The aim of present study was to find the effect of positional release therapy (PRT) V/S ischemic compression technique (ICT) with respect to VAS and WBLT on gastrocnemius for footballer players. Pain pressure algometer was used to assess the latent trigger point. The intervention lasted for 90 sec. 38 participants were randomly divided into 2 groups, group 1 received positional release technique (PRT), group 2 received ischemic compression therapy (ICT). The emphasis was given on reducing pain in gastrocnemius muscle and to improve active ankle dorsiflexion of the players to improve their onfield performance. Pain was measured using VAS (reliability of 0.97) and to measure active ankle dorsiflexion weight bearing lunge test (WBLT) (reliability of 0.97) was used. Scores were recorded pre intervention, immediately after intervention for every players in both groups.

A systemic study by J.Bryan Dixon, et al ,2009, stated that, the gastrocnemius is considered at high risk for strains formation of trigger points because it crosses two joints (the knee and ankle)and has a high density of type 2 fast twitch muscle fibres, gastrocnemius strain is associated with high-intensity running, acceleration, and deceleration activities 16. Wendy M meek, et al ,2022, in his study mentioned that, when the gastrocnemius is maximally stretched, the tension in the muscle can cause strain to the medial head of the gastrocnemius at the myotendinous junction. The medial head of the gastrocnemius is more prone to injury than the lateral head, possibly because the medial head contributes more to muscle activity.[17] A cross-sectional study by Rob Grieve, et al, 2011, concluded that taut bands were most prevalent in the right gastrocnemius medial head (81%); tender spot in left gastrocnemius medial head (52%).[18] A cross sectional study by Dr Dharmendra Patel, et al 2020 concluded the prevalence of increased latent trigger point in dominant leg could be possibly due to repetitive strain injury that can lead to damage to muscle fibre

which results into decreased strength and development of trigger point,[19] hence the intervention was given on medial head of gastrocnemius on dominant leg of players.

Graph and table 3a shows the intragroup immediate comparison of the VAS within Group A(PRT) where mean value for pre intervention is 6.52 and post is 5.39 with $p<0.05$, highlighting reduction is VAS score which shows statistically significant difference in pre and post values of VAS in Group A. The possible reason behind this could be the placement of muscle in a shortened position leading to the activity of intrafusal and extrafusal fibres and as result reduced discharge of gamma neurons. Hence, leading to reduction of muscle spindle activity, muscle tension, pain and restoration of normal movement when coupled with therapist manual contact and pressure on trigger point. Our results are in agreement with a study by Kojidi et. al 2013 who stated that following PRT there is secretion of hormones namely endorphins and enkephalins as a result of mechanoreceptor stimulation, reducing pain, improving blood circulation by removing chemical mediators of inflammation and reducing nociceptive sensitivity leading to increased pain threshold.[24] Sahem et.al 2013 in accordance to our hypothesis stated that an increased pain threshold is synonymous with a reduction in tissue sensitivity indicating that increased pain threshold in response to PRT leads to reduced pain.[25]

Graph and table 4a shows the immediate intragroup comparison of the WBLT within Group A(PRT) where mean value for pre intervention is 14.91 and post is 15.73 with $p<0.05$, highlighting increase in WBLT score which shows statistically significant difference in pre and post values of WBLT with $p<0.05$. Under normal circumstances, muscle fibres respond to trauma or abnormal stress by releasing calcium from the sarcoplasmic reticulum or through injured sarcolemma, which in return causes uncontrolled contraction activity and increased metabolism. This sustained muscle contraction decreases blood supply, leading to an accumulation of waste products and eventual muscle fatigue, evoking nociceptors that induce pain. This promotes a self-perpetuating circle; shortening of the muscle disposes to the loss of sarcomeres. Later, increasing the proportion of the collagen in the muscles contributes to the aggravation of pain and muscle stiffness, consequently decreasing active ROM.PRT appears to affect inappropriate proprioceptive activity during this phase, thus helping to normalize tone and set the normal length-tension relationship in the muscle. This results in the elongation of the involved muscle fibres to their normal state and subsequently increases the ROM. Our result in agreement with Nirali Jain, et al, 2020 who who mentioned in his study that PRT applied 90s on gastrocnemius and soleus muscle that have MTrP tends to normalize the muscle tone thus lengthen sarcomeres and subsequently permit more free movement and increasing AROM of ankle dorsiflexion.15

Graph and table 5 shows the intragroup immediate comparison of the VAS within Group B(ICT) where mean value for pre intervention is 6.55 and post is 5.54 with $p<0.05$, highlighting reduction is VAS score which shows statistically significant difference in pre and post values of VAS with $p<0.05$. The decreased VAS score and therefore reduced pain following ICT could be attributed to reactive hyperaemia in the trigger point region, spinal reflex mechanism for the region of muscle spasm. Also, local pressure may equalise the length of sarcomere involved in MTrPs consequently relieving pain. Our results are in accordance with Gemmell et al. who explored the immediate effects of 90s of ischemic compression versus ultrasound and sham ultrasound in 66 subjects concluding that there is an immediate decrease in MTrPs sensitivity after both modalities.26 In addition, the ischemic compression group also improved in cervical ROM. Supporting our results there is a study conducted by Hains et al. which examines the effect of myofascial therapy treatments using ischemic compression on shoulder trigger points in patients with chronic shoulder pain they found it effective in decreasing functional disability in the shoulder joints.[27]

Graph and table 6 shows the immediate intragroup comparison of the WBLT within Group B(ICT) where mean value for pre intervention is 14.36 and post is 14.90 with $p<0.05$, highlighting increase in WBLT score which shows statistically significant difference in pre and post values of WBLT with $p<0.05$. With regard to the increased ROM, the gradual pressure applied downward tends to release and break down collagen fibres in the contracted sarcomeres of the affected muscle fibres. This equalizes the length of sarcomeres. Subsequently, the palpable knot decreases and muscle fiber length

increases, thus increasing functional ROM. Our results are in accordance with Sahem et.al 2013 also states that the sustained pressure helps in lengthening the sarcomeres resulting in increased ROM.25 An article by Mary et. al 2001 also supports our results where she found manual therapies to have specific efficacy in increasing Pain Pressure Threshold and restricted ROM.

Graph 7 along with tables highlight the Intergroup comparison of mean variables between Group A (PRT) and group B (ICT) indicating that there was statistically nonsignificant difference observed in VAS score and ($p < 0.05$). Graph 8a along with tables highlight the Intergroup comparison of mean variables between Group A (PRT) and group B (ICT) indicating that there was statistically nonsignificant difference observed in WBLT score and ($p < 0.05$).

Thus, we summarize that both the techniques are statistically equally effective in reducing pain and improving active ankle dorsiflexion range of motion in gastrocnemius latent trigger point in football players. Comparatively both the technique shows similar effect. Hence, Both the technique can be used on field to improve immediate function of footballer players by increasing their active ankle dorsiflexion range and by actively reducing their calf pain

Conclusion

The present study concludes that both the techniques namely Positional Release Therapy and Ischemic Compression Technique showed statistically equal significant results in reducing pain and improving active ankle dorsiflexion in football players. And both techniques can be used on the field to improve the performance of football players.

Future Scope: Future study can be carried out with follow-up post 24 hrs after treatment to check the efficacy of treatment.

Limitation: Treatment was not given on the non-dominant leg of the player.

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Conflict Of Interest: Author has no conflict of interest.

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