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A study on efficacy of graston soft tissue mobilization technique on hamstring muscle in college level football players

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ABSTRACT

Background

In a football competition there is greater number of tackles, heading, kicking and higher percentage of the game is performed in maximum speed. Hamstring has major role on football players not only for preventing injuries, but also for improving performance level. Short hamstrings have been related to various lower limb injuries in football. Graston technique is an instrumental assisted soft tissue mobilization technique (GIASTM), uses a set of six stainless steel instruments to assists in manipulating tissues. The Graston instruments assist in fitting the shape of the body in order to scan, locate, and treat myofascial trigger points and adhesions in the soft tissue. GIASTM is a time-saving, useful modality and safe method for soft tissue restrictions and injury in sports.

Aim

Study to find out the efficacy of Graston instrumented assisted soft tissue mobilizations on Hamstring flexibility, Agility, and 20m Sprint in college level football players.

Methodology

Thirty College level footballers aged between 18-22 were assessed and selected for the study who satisfies the inclusion criteria were assigned into two groups of 15 subjects each: Group A- Experimental Group underwent a protocol with Graston instrumented assisted soft tissue mobilization technique along with Conventional exercises and Group B- Control Group was treated with only Conventional exercises and performed it for 3 weeks (3days/week). The outcome measures used were Sit and Reach test, BALSOM Agility Test (BAT), 20 m sprint run test. Using these outcome measures pre-test and post-test values were obtained.

Result

The results were analysed using student t-test. Paired t-test was used to compare the results within the group and unpaired t-test to compare results between the groups. Significance level kept $p<0.05$. In 20m Sprint test, since the t-value2.395, shows p- value <0.05, there is a significant difference in post-test 20m Sprint test scores between the experimental and the control groups. The difference 0.15 is the difference between mean in two groups (3.38&3.53). Although both groups showed improvement, the scores in the experimental group is significantly higher than that in control group.In the flexibility, since the t-value 0.969, shows p value 0.341, there is no significant difference in post-test flexibility score between the experimental and the control group.

The difference (1.66) shows the difference between mean in two groups (35.33&33.67). Although both group showed improvement, the scores in the experimental group is significantly higher than that in control group.In the BALSOM Agility test, since the t-value 1.035, shows p-value 0.309, there is no significant differences in post-test BALSOM Agility run score between the experimental and the control groups. The differences (0.16) show the difference between mean in two groups (12.21&12.37). So, the experimental group shows more significant improvement in the Agility.

Conclusion

The Graston instrumented assisted soft tissue mobilization on Hamstring muscle is effective in sprint performance. Since reducing the fatigue of hamstring muscle, improve quickness, and enhancing the sprinting activities on football event. Therefore GIASTM on Hamstring muscle is effective and improves the performance level on highly sprinting demanded player's in football and other sporting events. GIASTM technique is simple and cost effective and can be given adjunct to physiotherapy treatment.

Keywords:- Graston instrumented assisted soft tissue mobilization (GIASTM), Hamstring flexibility, Agility, Sprint

INTRODUCTION

In football the basic movement patterns require rapid force development and high power output and the ability to efficiently utilize the stretch shortening cycle in ballistic movements. The lower extremities are more work rate in basic football activities, lower extremities muscle strength and anaerobic power are neuromuscular variables that influence in high level of performance in football event.

It is important to maintain flexibility over lower extremity muscle in football, especially hamstring muscle, there is a relationship between hamstring muscle flexibility in high intensity performance in football specific skills such as sprinting, agility, jumping, and kicking of ball.

In football event hamstring is important muscle component in lower limb and it has more work rate and injured than other muscle components. Due to the high performance demands injuries that are occurring during the activities such as rapid acceleration and deceleration, jumping, cutting, pivoting, and kicking of the ball, in these activities either slow or fast movements that involves simultaneous hip flexion and knee extension. These movements place the hamstring in a position of extreme stretch, with injuries most common in semimembraneosus muscle and its proximal free tendons.

High speed running is the most common injury prone activity in footballer, high intensity performance with sprinting make footballer more susceptible for hamstring strain. Sprint performance one of the most important move of the football match, although high speed movement only contributing 11% to the total distance. Sprinting performance contribute directly to score goal and keep the ball which most important move over a football match and hamstring muscle has major role in sprint performance.

The college level football players shows high incident rate of hamstring tightness 84% and lack of flexibility than other lower limb extremity muscles. As football is a sport that much involves of physical strength and flexibility, so that most of the young collegiate footballers are mostly under non professional guidance and they are more susceptible to musculoskeletal injuries due to lack of proper awareness of warming up stretching and cool down techniques, which in turn increase the risk of injury and could affects the level of their performance. It's important to maintain the hamstring muscle flexibility as these muscles are under greater usage while playing football event.

Instrumented assisted soft tissue mobilization (IASTM) is a technique that involves using specially designed instruments to provide mobilizing effect to soft tissue to decrease pain and improve range of motion and function.

The Graston technique (GT) is one of the most common forms of IASTM that uses six different stainless steel instruments varying in shape and size to detect and eliminate the adhesions with the scar tissue, adhesions and myofascial limitations.

The GT1 instrument is the longest instrument than other tools with a single bevel surface, and it is mainly used for large areas of the body such as back muscle, hamstring muscle, quadriceps muscle, and gluteus muscles.

The Graston instrument assisted soft tissue mobilization (GIASTM) has become increasingly used in sports field for the treatment of myofascial restrictions. It promotes myofasical relaxation by eliminates adhesions within scar tissue and increase the cell activities, blood flow, skin temperature and muscle strength. The main principles of GIASTM are depending of removal of scar tissues and promote normal function of soft tissue regeneration.

The GIASTM produce a pressure and shearing force to the soft tissues which removes scar tissues by micro vascular and capillary haemorrhage along with a localized inflammation. This inflammation process stimulates the healing process and reparative system, by removing scar tissues and breaking of adhesions and also promoting blood and nutrients supply to the injured area and migration of fibroblast. Thus facilitating the new collagen synthesizes deposition, maturation and regeneration of the injured tissues.

Graston soft tissue mobilization technique helps to improve hamstring muscle flexibility in college level football players. Improvement in parameters like hamstring flexibility and physical performance such as agility and sprint performances in college level football players.

METHODOLOGY

Study setting

- Sacred Heart College, Thevara.
- FACT Football Academy, Eloor.
- Maharaja's College, Ernakulam.

Sample size

- N= 30
- 15 in each group (Group A and Group B).
- Total study duration: 3 months.
- Current study duration**:** 6 weeks.

Inclusion criteria

- Age – 18 to 25.
- College level male football players.
- Players who are actively playing football since 2 years.
- Players who are actively participating in a college football team.

Exclusion criteria

- Players who had not playing for consistent season.
- Players with any back injuries, any disc problems.
- Players with any hamstring injuries and quadriceps injuries.
- Players having any acute infectious diseases, epilepsy, hearing problems and blood clotting disorders.
- Players with any biomechanical anomalies.
- Players with history of lower limb fractures.
- Recent fractures and playing with implants or orthopaedic conditions.
- Players having any neurological deficit.
- Player with tattoos over the lower limb.
- Players who are not willing to participate.

Procedure

30 subjects were included from Sacred Heart College, FACT football academy and Maharajas College in Ernakulam, between the ages of 18-25 years were taken for the study. Players are actively participating in the current college football team.The study was conducted in off season at various centres fulfilling the inclusion criteria were selected for the study. The total study duration was of 3 months.

Subjects were divided in to two groups (group A & group B) 15 number in each group:-

- Group A-Experimental group received Graston soft tissue mobilization technique with conventional physiotherapy for 3 sessions per week for a period of 3weeks, and each session carried out 40 min.
- Group B- Control group, received only conventional physiotherapy for 3 sessions per week for 3 weeks, each session carried out 40 min.

Outcome measurements

Flexibility: (SIT AND REACH TEST) to measure hamstring muscle flexibility.

Agility: (BALSOM AGILITY TEST) to assess the agility in football players

Functional fitness: (20 METER SPRINT TEST) to assess sprint performance in football players

Graston soft tissue mobilization technique and Conventional physiotherapy on Experimental group A

In the Graston soft tissue mobilization technique, procedure consists of 5 phases:

- Warm up
- Graston technique
- Passive stretching
- Strengthening
- Cryotherapy.

Total time duration: 40 min, 3 sessions/week for a period of 3week.

Conventional Physiotherapy on Control group B

In conventional physiotherapy technique consist of 4 phases:

- Warm up.
- Cryotherapy.
- Passive stretching.
- Strengthening.

Conventional Physiotherapy programme protocol Total time duration: 40 min, 3 sessions / week for a period of 3 week.

The experimental group received the Graston soft tissue mobilization (G1 tool) over the Hamstring muscle. The Control group received Conventional physiotherapy procedures only.

- **Warm up:** warm up is the first phase of Graston treatment procedure. Each group started the experiment with jogging, 10-15 min of light jogging in around the ground as per their warm up routine. After that warming up the treatment procedures start.
- **Graston technique:** after 15 min of warming up Graston technique will be performed. Only the experimental group will received the typical Graston technique over the hamstring. The Graston technique applied over the hamstring using Graston G1 tool, G-xtreme tool will used in this study.Before starting the treatment explain the treatment procedures to the subjects.

After that the subjects positioned comfortably on the couch, on prone position and bend the knee joint around 30^0 to 60^0 with supported the ankle over a pillow, wipe out both hamstring areas using towels for avoiding sweat and dust particles. Emollient (moisturize cream) apply over both hamstring before application of the tool, for avoid friction and easy flowing the tool over the treatment areas.

Then the Graston G1 tool used for the soft tissue mobilization, long stroke applied over the hamstring distal to proximal area, from the poplieteal line to the gluteal line. First apply the scanning long stroke with light pressure and slow manner using the concave surface. Then the warming up stroke are performed with light to medium pressure stoke about 250 g pressure over the area, the tool will keep in45^0 angle and total 60-120 sec duration. The same procedure will continued over the opposite limb, total 2 min treatment time.

- **Stretching:** After the Graston soft tissue mobilization static stretching for the hamstring will perform. 3 repetition with 30 second holding time,10 sec relaxation for each repetition and total duration of 2min.
- **Strengthening exercise:** 1 min relaxation time after the stretching exercise strengthening exercise performed over the hamstring muscle. Bridging exercise performed under instruction. 10 repetition with10 sec holding time in between 10 sec relaxation period, total duration of 3 min.
- **Cryotherapy:** 1 min relaxation time after strengthening exercise Ice packs applied over both hamstring. The participants are in prone position ice packs applied directly in both thighs up to 10 to 20 min duration, in convenience of the participants.
- Both experimental group and control group are going through these procedures, 3 days per week in between rest period and total of 9 sessions.After the completion of 9 sessions post test will performed in both groups and values were taken.

Materials used

- Graston G1tool
- Emollient
- Towels
- Ice packs
- Cones
- Markers
- Meter tape
- Stop watch
- Evaluation or data collection sheet
- Couch
- Sit and Reach box

Statistical analysis and interpretation

Table 1: Demographic presentation of age/ height /weight/ BMI

Variables	Experimental group	Control group
Age	19.4	18.66
Height	172	169.73
Weight	63.4	62.8
Body mass index	21.52	21.77

Patients are distributed in both groups homogenously.

Table 2: Hamstring flexibility using sit & reach test

Hamstring flexibility					
	Test	Group A	Group B	Unpaired test	
				t	P value
	Pre	28.87	31.2	1.44	0.162
	Post	35.33	33.67	0.969	0.341
Paired test	T	19.24	6.56		

	P value	<0.001	<0.001

The above table shows that Group A with t=19.24 (p<0.001).Whereas Group B showed t=6.56 (p<0.001).when comparing the post test Hamstring flexibility there is no significant difference between Group A and Group B, t=0.969 with (p 0.341).Also the pre-test score of both groups were homogeneous. (t=1.44 with p=0.162)

Table 3: Agility using BALSOM Agility run test

Agility					
	Test	Group A	Group B	Unpaired test	
				t	P value
	Pre	12.57	12.69	0.856	0.4
	Post	12.21	12.37	1.035	0.309
Paired test	T	4.64	5.34		
	P value	<0.001	<0.001		

The above table shows that Group A with t=4.64 (p<0.001).Whereas Group B showed t=5.34(p<0.001). When comparing. The post test agility there is no significant difference between Group A and Group B, t=1.035 with (p 0.309). Also the pre-test score of both groups were homogenous. (t=0.856 with p=0.4).

Table 4: Sprint using 20m Sprint run test

20m sprint					
	Test	Group A	Group B	Unpaired test	
				t	P value
	Pre	3.59	3.57	0.4	0.692
	Post	3.38	3.53	2.395	<0.05
Paired test	T	3.9	4.5		
	P value	<0.001	<0.001		

The above table shows that Group A with t=3.9 (p<0.001).whereas Group B showed t=4.5 (p<0.001). When comparing the post test 20m sprint there is a significant difference between Group A and Group B, t=2.395 with (p<0.05). Alsothe pre-test scores of both groups were homogenous.(t=0.4 with p=0.692). Hence Group A showing significantly increased Sprint performance.

DISCUSSION

This study was conducted to know the efficacy of Graston Instrument Assisted Soft tissue Mobilization (GIASTM) on Hamstring flexibility, Agility, and 20m sprint on Hamstring in college level football players.

Players who are actively participated on the college football team were assessed and selected for the study who satisfied the inclusion criteria. 30 subjects (males), age 18-23 years taken for the study. Subjects divided equally into two groups, Group A and Group B using randomized method. Each group consists of 15 subjects. Group A received Graston Instrumental Assisted soft tissue Mobilization with Conventional physiotherapy 40 min a day, 3 days/week for 3 weeks. Group B received conventional physiotherapy 35 min a day, 3 days/ week for 3 weeks. The outcome measures were assessed using Sit & Reach test for Hamstring muscle flexibility, Balsom Agility run test for Agility, 20M Sprint run test for Sprint performance.

In the statistical analysis Students‘t’ test was used for the calculation of the results. Paired‘t’ test was used for the intra group comparison of pre and post test results. Independent‘t’ test was used for the inter group comparison.

While within group comparison both interventions are showed improvement in Hamstring flexibility, Agility and 20m Sprint. In comparison between groups, the post test mean change of 20M Sprint in Experimental group was 3.38 and in control group 3.53 with (p<0.05). The experimental group shows greater change in 20M Sprint performance, which is statistically significant when compared with other group. The reason behind the improvement in experimental group is due to the applications of GIASTM tool over muscle suddenly the skin will accumulate

friction related heat, it helps in fluid exchange and also increases oxygen supply to the soft tissue to reduce focal vasculopathy and accelerate muscle fatigue recovery and muscle function by activating waste elimination and increased metabolism. When the muscle fatigue is decreased there is quick action in tissue regeneration through collagen synthesis, reducing the cardiac burden by altering cellular membrane permeability, increasing blood flow and activating the nutrients supply and decomposition of lactic acid.Applications of Graton soft tissue mobilization technique effectively increase the recovery rate from muscle fatigue and also improve the physical performance on young footballers.

In GIASTM application programme it increases proprioceptor activation and nervous systems reactivity and that improve muscle strength short distance directions and quickness. Such proprioceptor activation improves performance from increased neural responsiveness due to joint stabilization and increased quickness. May be this is the reason for the more improvement on GIASTM experimental group.

Jonggumkim et al. Revealed that instrumented assisted soft tissue mobilization improves performance in young male footballers. It improves isokinetic muscle power, decrease muscle fatigue rate and fitness in young football players.

In comparison between groups, the post test mean change in Hamstring flexibility on experimental group was 35.33 and in control group 33.67 with p value of 0.34. There is no statistical significant difference between experimental group and control group; here the null hypothesis was accepted.

Nathen j. Hoffmeier et al. revealed that single application of Graston technique on Hamstring does not change on musculotendinous stiffness of flexibility on recreationally active individuals.

In comparison between groups, the post test mean change in Agility on experimental group was 12.21 and in control group 12.37 with p value of 0.309. There is no statistical significant difference between experimental group and control group. Here the null hypothesis is accepted. Since there is constant change in direction on Agility, it is evident that application of GIASTM does not have effect much result on agility. Agility is the power of movement, move quickly and easily change body position on various directions.

Vardiman et al. reported that a single application of IASTM in healthy men does not affect changes in ROM.

These results shows that Graston instrumented assisted soft tissue mobilization on hamstring have not effective on hamstring flexibility and agility on college level footballers.

Hence the discussion can be concluded that the Graston technique on Hamstring will improves sprint performance on college level football players. Which helped in performance and also in fitness level, on field it improves quickness and sudden explosive power on sprint level and also positive effect on performances on field.

Limitations of the study

1. The study was done on a small sample size.
2. Only short term effects were being evaluated.
3. Study conducted only in college level male footballers.
4. As the measurements were taken manually, this may leads human errors.
5. Measurements were taken immediately after intervention.
6. Duration of study is only 6month

CONCLUSION

The result of the study showed that Graston Instrumented assisted soft tissue mobilization on Hamstring along with conventional exercise demonstrated a significant improvement in Hamstring flexibility, Agility, and 20m sprint as measured by sit and reach test, balsom agility run test, 20m sprint run test respectively after 3 weeks of application.

Statistical improvement was evident while comparing the post intervention reading with pre intervention reading of both Experimental group and Control group. But greater significance was seen in case of experimental group only on 20M sprint performance compared to control group.

Thus it can be concluded that, Graston Instrumented Assisted soft tissue mobilization on Hamstring muscle is effective in sprint performance. Since reducing the fatigue of hamstring muscle, improve quickness, and enhancing the sprinting activities on football event. Therefore GIASTM on Hamstring muscle is effective and improves the performance level on highly sprinting demanded player's in football such as central forward and left, right wing forwards footballers.

Conflict of interest

None

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Ethical clearance

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