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Research Paper

Evaluating the Impact of Foam roller and IASTM on Calf Pain and functional performance of Hockey Players

Dr. Sanket Bajpai [1], Dr. Ashish Jaiswal [2*], Dr. Ruchi Mishra [3], Saksham Mishra [4]

[1,3] Professor, Department of Physiotherapy, R.D. Gardi Medical College, Ujjain, Madhya Pradesh, India

[2] Associate Professor, Department of Physiotherapy, R.D. Gardi Medical College, Ujjain, Madhya Pradesh, India

[4] Student of the University of Birmingham, UAE

Corresponding Author: *Dr. Ashish Jaiswal

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ABSTRACT

Field hockey is an intensely physical sport involving frequent bursts of speed, sudden directional changes, and prolonged training hours, all of which increase the risk of musculoskeletal injuries, particularly in the lower limbs. Calf muscle pain, whether caused by acute trauma or chronic overuse, is one such common complaint among athletes. This study aims to evaluate and compare the therapeutic effects of Instrument-Assisted Soft Tissue Mobilization (IASTM) and foam rolling techniques in alleviating calf muscle pain in female field hockey players. Conducted in Ujjain city, this comparative study enrolled 20 female players aged 18–26 years suffering from bilateral calf pain. Participants were divided equally into two groups: Group A received IASTM treatment every alternate day, while Group B underwent daily foam rolling sessions over seven days. Pain intensity was assessed using the Visual Analogue Scale (VAS) on the first, fourth, and seventh days. Statistical analysis revealed significant pain reduction in both groups; however, the decrease in Group A was notably higher, indicating superior efficacy of IASTM over foam rolling. These findings suggest that IASTM may offer a more effective short-term intervention for sports-related calf muscle pain in female hockey players.

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1. INTRODUCTION

Field hockey is a globally recognized sport, played at both recreational and competitive levels, that demands a high level of physical exertion, agility, and endurance. As a high-speed, intermittent team sport, it is characterized by rapid acceleration, sudden deceleration, quick direction changes, and repetitive lower-limb movements. These physical demands place field hockey players, particularly female athletes, at increased risk of sports-related injuries, with the lower limbs being especially vulnerable. According to the NCAA Injury Surveillance Program (2020), lower extremity injuries account for over 65% of all injuries in women's field hockey, with calf strains being among the top five most common soft tissue injuries.

The calf muscle complex is located in the posterior compartment of the lower leg and comprises the gastrocnemius, which originates above the knee joint, and the soleus and plantaris, which arise below the knee. These muscles play a critical role in activities such as running, jumping, sprinting, and pushing off the ground, all of which are integral to hockey performance. Given the biomechanical demands of the sport, calf muscles are often subjected to overuse, fatigue, and strain, making them

susceptible to both acute and chronic injuries. Acute calf muscle injuries are typically associated with a sudden onset of sharp pain, often accompanied by a sensation of tearing or pulling, while overuse injuries result from cumulative microtrauma that exceeds the muscle's capacity for repair.

In field hockey, the nature of gameplay often includes explosive efforts followed by active recovery, increasing the likelihood of muscle fatigue and injury during high-intensity phases. A study by Barboza et al. (2018) on field hockey injury epidemiology confirmed that muscle strains and overuse injuries in the lower leg are significantly prevalent, especially in players undergoing high-volume training routines.

Management of calf muscle injuries requires a multidisciplinary approach that includes rest, proper warm-up and cool-down routines, flexibility training, and physiotherapeutic interventions. In recent years, non-invasive therapeutic techniques such as Instrument-Assisted Soft Tissue Mobilization (IASTM) and foam rolling have gained popularity as effective strategies for reducing muscle tightness, alleviating pain, and restoring normal tissue function. Both methods aim to enhance myofascial mobility and promote tissue healing, but they differ in their mechanisms and application procedures.

IASTM is a manual therapy technique that involves the use of specially designed instruments to detect and treat soft tissue dysfunction. This technique is based on the principles of cross-friction massage and aims to stimulate a localized inflammatory response, which promotes fibroblast activity and collagen remodeling. A study by Sevier and Stegink-Jansen (2015) demonstrated that IASTM significantly improved pain, flexibility, and function in patients with soft tissue injuries by enhancing the alignment of collagen fibers and reducing tissue adhesions.

Foam rolling, also referred to as self-myofascial release (SMR), involves using one's body weight to apply pressure to soft tissue through a cylindrical foam roller. This technique is accessible, inexpensive, and easy to perform, making it a popular choice among athletes for pre- and post-activity recovery. Research by Cheatham et al. (2015) supports the benefits of foam rolling in increasing joint range of motion (ROM) and reducing delayed onset muscle soreness (DOMS). Additionally, a meta-analysis published in the Journal of Bodywork and Movement Therapies (2019) concluded that foam rolling improves soft tissue extensibility and short-term pain relief, though its effects may not be as deep or long-lasting as IASTM.

Despite the growing body of literature supporting both IASTM and foam rolling, there remains a paucity of comparative studies that evaluate their relative effectiveness in managing calf muscle pain, particularly in the context of female athletes in India. Female hockey players often undergo rigorous training regimens and experience similar injury profiles as their male counterparts, yet gender-specific research is limited. Understanding the comparative benefits of these two interventions is essential for optimizing rehabilitation strategies, reducing downtime, and enhancing athletic performance in this population.

This study was therefore designed to compare the effectiveness of IASTM and foam rolling techniques in treating calf muscle pain among female field hockey players in Ujjain, Madhya Pradesh. By focusing on a cohort of 20 athletes aged 18–26 years suffering from bilateral calf pain, the study seeks to evaluate which of the two methods yields better outcomes in terms of pain reduction over a seven-day intervention period. Pain intensity was measured using the Visual Analogue Scale (VAS) at three intervals: baseline (pre-treatment), mid-treatment (day 4), and post-treatment (day 7). The results of this research may contribute to evidence-based practice in sports physiotherapy by providing insights into the practical applications of IASTM and foam rolling in real-world athletic settings.

2. REVIEW OF LITERATURE

The use of manual and mechanical interventions for soft tissue injuries has gained considerable attention in sports medicine. Several studies have examined the role of Instrument-Assisted Soft Tissue Mobilization (IASTM) and foam rolling in alleviating muscular pain and improving performance outcomes, yet direct comparisons remain limited.

Kim, Sung, and Lee (2017) explored the physiological mechanisms and practical application of IASTM, highlighting that the technique promotes fibroblast proliferation and collagen synthesis via localized inflammation. Their findings emphasize that IASTM effectively improves tissue elasticity and structural alignment, making it suitable for treating chronic soft tissue injuries.

Sevier and Stegink-Jansen (2015) further supported this view through clinical observations and trials. Their study indicated that IASTM, when applied consistently, led to a statistically significant improvement in range of motion, reduction in pain, and functional outcomes in patients with soft tissue dysfunctions. This improvement was attributed to the technique's ability to disrupt fibrotic adhesions and stimulate the body's natural healing processes.

Jones et al. (2019) conducted a pilot study investigating the use of the Graston technique, a form of IASTM, in managing chronic plantar heel pain. Their results demonstrated improved patient-reported outcomes in pain intensity and walking function, even in subjects with symptoms lasting more than six weeks. This suggests that IASTM is effective not only for acute injuries but also for persistent, chronic cases.

In contrast, foam rolling has been widely studied for its ease of use and application in self-myofascial release (SMR). Cheatham et al. (2015) conducted a systematic review analyzing the efficacy of foam rolling in increasing joint range of motion and decreasing delayed onset muscle soreness (DOMS). The findings suggested that short-term use of foam rolling post-exercise can lead to improved flexibility and decreased perception of muscle stiffness.

Aishwarya Ranbhor et al. (2021) evaluated the impact of foam rolling versus static stretching on gastrocnemius and soleus muscles. Their randomized trial found that foam rolling produced a greater increase in pressure pain threshold (PPT) and flexibility compared to static stretching, validating its role in enhancing tissue resilience.

In a gender-focused context, Swowden et al. (2014) examined chronic leg pain among female field hockey players, identifying repetitive overuse as a key cause of calf strain. Their work underscores the importance of early diagnosis and soft tissue therapies for injury prevention and performance maintenance.

Barboza et al. (2018), through a systematic review of injuries in field hockey, reported that lower extremity injuries—including calf muscle strains—are common, especially among female athletes due to biomechanical and hormonal factors. The study recommended targeted interventions, such as structured rehabilitation protocols, for injury prevention and recovery.

Vijayakumar et al. (2019) compared compressive myofascial release and IASTM in individuals with calf muscle trigger points affecting ankle dorsiflexion. Both methods improved ROM and reduced pain, but IASTM showed a slightly more pronounced effect on pain alleviation.

Cluett (2021) outlined the causes and treatment options for calf muscle injuries in athletes. He noted that interventions that increase blood flow and tissue elasticity, such as IASTM and foam rolling, are among the most effective non-pharmacological treatments.

Collectively, the literature demonstrates that while both IASTM and foam rolling are effective for managing soft tissue dysfunction, IASTM may offer deeper, more targeted relief. However, foam rolling remains a practical, low-cost method for self-management, especially in athletic populations.

Despite these individual findings, direct comparative data on IASTM and foam rolling remains sparse, particularly among young female athletes. This research aims to fill that gap by applying both interventions under controlled conditions and measuring outcomes quantitatively using VAS scores.

3. METHODOLOGY

This comparative interventional study was conducted over a span of seven consecutive days at the Polytechnic College Ground, Ujjain, Madhya Pradesh. The study population consisted of 20 female hockey players aged between 18 to 26 years who presented with bilateral calf pain persisting for more than one month. Ethical clearance was obtained from the institution, and written informed consent was collected from each participant prior to inclusion in the study.

Participants were allocated alternately into two groups. Group A (n=10) received Instrument-Assisted Soft Tissue Mobilization (IASTM) using the Graston technique, administered every alternate day. Group B (n=10) received foam roller therapy daily. Both interventions focused on the calf region. Before each session, the examiner palpated the calf muscles to locate trigger points. These points were marked and targeted during the treatment sessions. Lubricant was used to enhance the movement of the IASTM tool, whereas body weight pressure was applied for foam rolling.

Pain levels were recorded using the Visual Analogue Scale (VAS) on Day 1 (pre-treatment), Day 4 (mid-treatment), and Day 7 (post-treatment). Subjects were not allowed to use painkillers or sedatives during the study duration. The sessions lasted 10–15 minutes per individual, and adherence to intervention protocol was strictly monitored.

Inclusion Criteria

- Female hockey players aged 18–26 years.
- Calf muscle pain for more than one month.
- Bilateral pain localized to the gastrocnemius or soleus.
- Minimum training workload of 20 hours per week.

Exclusion Criteria

- Skin infections, dermatitis, or open wounds on the calf.
- Use of analgesics or anti-inflammatory medications during the study.
- History of surgery, fractures, or tumors in the lower limbs.
- Neurological disorders or sensory deficits.

Statistical Analysis

Statistical analysis was performed using SPSS version 18. Descriptive statistics were used to compute means and standard deviations. Paired t-tests assessed within-group changes, while independent t-tests evaluated between-group differences. A *p*-value of <0.05 was considered statistically significant.

4. RESULTS

The mean age of participants was 21.75 years (SD = 1.93), with a range from 18 to 25 years. All subjects completed the study without adverse effects or dropout.

Table 1: Mean VAS Scores in Group A (IASTM)

VAS Assessment	Mean ± SD	p-value
Pre-Test	7.5 ± 1.02	-
Mid-Test	6.6 ± 1.01	< 0.00000001
Post-Test	2.0 ± 0.89	< 0.00000000004

Table 2: Mean VAS Scores in Group B (Foam Roller)

VAS Assessment	Mean ± SD	p-value
Pre-Test	7.5 ± 1.02	-
Mid-Test	7.1 ± 1.04	< 0.00000007
Post-Test	3.3 ± 2.28	< 0.000000007

Table 3: Comparison of Post-Test VAS Between Groups

Group	Mean ± SD	t-value	p-value
A (IASTM)	2.0 ± 0.89	2.57	0.0192
B (Foam Roller)	3.3 ± 2.28		

The results indicate a significant reduction in pain within both groups. However, the reduction was markedly greater in the IASTM group compared to the foam roller group.

DISCUSSION

The findings of this study demonstrate that both IASTM and foam rolling effectively reduce calf muscle pain in female field hockey players. However, IASTM was significantly more effective over the seven-day intervention period. This aligns with previous research conducted by Jooyoung Kim et al. (2017), who concluded that IASTM enhances fibroblast

proliferation and promotes healing through controlled microtrauma and collagen realignment.

The application of the Graston technique in Group A allowed for deeper tissue mobilization and better release of myofascial adhesions, which is consistent with the mechanism proposed by Sevier and Stegink-Jansen (2015). The controlled pressure exerted by IASTM tools may have led to an inflammatory response, thereby initiating tissue remodeling and reducing the presence of scar tissue, which is a major source of pain and stiffness.

In contrast, foam rolling, though beneficial, produced less significant pain reduction. According to Cheatham et al. (2015), foam rolling increases blood flow and enhances tissue pliability through pressure-induced fascial release. However, its effectiveness may be limited in deep muscle regions like the gastrocnemius compared to the mechanical precision offered by IASTM tools.

Aishwarya Ranbhor et al. (2021) also found that foam rolling is beneficial in reducing pain and improving range of motion, though not as effective as stretching or targeted manual therapy. Similarly, Barboza et al. (2018) emphasized the need for structured injury management protocols in field hockey due to the high prevalence of lower limb injuries.

The within-group improvements in Group B suggest that foam rolling still plays a useful role in daily recovery routines. However, the more consistent and significant improvements in Group A validate the application of IASTM as a therapeutic technique in sports physiotherapy settings, especially for treating athletes with localized myofascial pain syndromes.

It is also noteworthy that IASTM sessions were conducted only on alternate days, whereas foam rolling was administered daily. Despite fewer sessions, the IASTM group achieved better results, further highlighting its clinical efficacy.

CONCLUSION

The present study provides compelling evidence supporting the use of Instrument-Assisted Soft Tissue Mobilization (IASTM) over foam rolling for the short-term management of calf muscle pain in female hockey players. While both interventions significantly decreased pain intensity, IASTM proved more effective within the same timeframe. This suggests its superior capacity to address deep tissue dysfunction and promote faster recovery. Clinicians and sports physiotherapists are encouraged to consider integrating IASTM into rehabilitation protocols for athletes experiencing myofascial calf pain.

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