Comparing the impacts of Instrument assisted soft tissue mobilization and Dry Needling on pain and functional status in the patients with Hamstring tightness

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ABSTRACT

Objective: Hamstring is one of the most critical muscle groups to maintain the gait cycle, but it is also one of the most commonly injured.The purpose of the research was to assess the comparative impacts of IASTM and dry needling on pain and functional status in participants with hamstring tightness.

Methods: A randomized clinical trial with 36 patients was carried out atgovernment hospital of Nankana Sahib. Based on pre-selected criteria, participants were recruited and categorized into 2 groups at random. First group gotdry needle therapy and second group was giventhe treatment with Instrument-Assisted Soft Tissue Mobilization (IASTM). Pain levels was evaluated using the Numeric Pain Rating Scale (NPRS), and functional activities was measured using the Lower Extremity Functional Scale (LEFS).

Results: A significant difference was found in mean of pre and post treatment values ($p<0.05$) of NPRS and LEFS in both groups. Across groups analyses revealed no significant disparity in NPRS and LEFS ($p>0.05$) after treatment of four weeks.

Conclusion: Both IASTM and dry needling were found to be equally effective for diminishing pain, improving lower extremity functioning in patients with hamstring tightness.

Keywords: Functional status, Hamstring flexibility, Numeric pain rating scale, Tightness

INTRODUCTION

In Hamstring muscle there are three heads. A small head and a long head make up the biceps femoris muscle. The long head allow hip and knee flexion as well as extension. The short head of the biceps femoris, on the other hand, only enables knee flexion due to its monoarticulation. Located medial to the bicep femoris, this semimembranous muscle arises from the pelvic ischial tuberosity and inserts into the tibial medial condyle. Internal rotation and leg flexion are accomplished by this muscle. It is a semitendinous muscle that bends the knee and goes medially to the bicep femoris(1). Semitendinosus and semimembranosus are roughly 44.3 and 38.7cm long, respectively (2). It is one of the most critical muscle groups to maintain the gait cycle, but it is also one of the most commonly injured. A high incidence of hamstring tightness among diamond sorters is present with 94% of workers felt tightness in their left hamstrings and 95.3% in their right hamstrings (3). Females have a Ninety-six percent prevalence of hamstring tightness and males have four percent prevalence. Between the ages of 18 and 25, it is prevalent among college students (4, 5).

Patellar tendinopathies, femoro-patellar discomfort, a sign of damage to the muscles after eccentric exercise, and hamstring injuries are all linked to decreased flexibility in the hamstrings (4).Flexibility is seen as a crucial component of the body's basic biomechanical function. Reduced muscle deformation leads to a restricted extent of motion at the site where the muscle acts, leading to muscle tightness (3).Prolonged sitting can have negative effects on flexibility of hamstring and might lead to hamstring tightness. It might happen as a result of issues with the muscle's length-tension relationship. Unnecessary stress may influence the musculo-tendinous unit, predisposing the muscle to aberrant length, either shortened or lengthened which may lead to pain and tightness or decreased flexibility (6). A persistently shortened posture produces hamstring trigger points and creates muscle stiffness during extended sitting (7). As a result, excessive sitting and poor physical performance resulted in a considerable rise in hamstring tightness (8).

In present study the comparative effects of two interventions including Instrumental assisted soft tissue mobilization and dry needling was assessed on pain and functional status in patients suffering with hamstring tightness.IASTM approaches are a novel approach that is becoming more and more popular in modern therapy due to its effectiveness in releasing myofascial trigger points and total body realignment (9). In order to achieve irritating contracture and adhesion release, myofascialmobilisation, and the breaking down of detrimental cross-links among tissues, IASTM techniques depend upon the use of specialised stainless steel equipment. In addition, these methods of therapy aim to enhance circulation of lymph and venous return, as well as increase body temperature, stimulate cell proliferation (including mast cell activity and fibroblasts), and boost nourishment through enhancing the flow of blood to and from the region being treated (10). Dry needling and acupuncture are two treatment methods that use needles for managing patients in order to produce a particular therapeutic effect. Dry needling uses solid needles, similar to those used in acupuncture, or a hypodermic needle occasionally, but nothing are injected(11).Myofascial trigger points were the main target of dry needling in the beginning.Dry needling's proposed mechanism of action includes neurophysiological effects, segmental inhibition, endogenous opioid release, effect on neurotransmitter release including serotonin and noradrenaline, conditional pain modulation, peripheral sensitization, taut band effects, and percutaneous electrical nerve stimulation. The most probable method of reducing ache with needle stimulation is excessive stimulation analgesia. Needling is said to produce a variety of neurotransmitters such as endorphins, serotonin, and cortisol. The sensation that is produced when a needle is swiftly pushed into soft tissue causes a great deal of sensory afferent proprioceptive signal to be sent to the spinal cord. By blocking the transmission of painful signal, produced in the noci-ceptors via the intradorsal horn, this may have a "gate-control" impact (12).

A literature gap existed, lacking a robust comparison betweenInstrument-Assisted Soft Tissue Mobilization (IASTM) and Dry Needle (DN) for addressing tightness of hamstring. This researchwill promote evidence-based practice and clinical decision-making, providing physiotherapistsdefinitive guidelines for choosing the most beneficial intervention for patients with hamstring tightness.

MATERIALS AND METHODS

Arandomisedclinicaltrial wasperformed at government hospitals at District Nankana Sahib. The study period was about nine months.A total of 36 participants with hamstring tightness were recruited by using a convenient sampling technique and was categorized into twogroups randomly. Both females and males patients of age about eighteen to forty years, having a-traumatic back or knee painfor more than or equal to eight weeks with passive hip flexion less than or equal to 75 degrees were recruited. Patients were excluded if they had any problem of radiculopathy in lumbar region, or history of surgery of lower limb or back area, any infective disease or meniscal knee injury. Informed consent formed was signed by all patients before inclusion in research. First group got dry needle therapy and second group was given the treatment with Instrument-Assisted Soft Tissue Mobilization (IASTM). Both groups was also given conventional treatment of hamstring stretching.Pain levels was evaluated using the Numeric Pain Rating Scale (NPRS), and functional activities was measured using the Lower Extremity Functional Scale (LEFS). Assessments were made prior to and after the four-weeksintervention period.

The one accurate and consistent method for determining the degree of pain is to use a numerical pain rating scale. '0' indicates no pain and '10' indicates extreme discomfort or pain on the eleven-point numerical scale (13). When comparing the NPRS to the VAS among individuals with arthritic and other chronic pain syndromes, strong correlations were found for construct validity, ranging from 0.86 - 0.95. Prior and following medical assessment, both literate and illiterate individuals showed a high level of test-retest reliability (r = .96 & .95, correspondingly) (14).

The Lower Extremity Functional Scale (LEFS) is a survey questionnaire including 20 items regarding the capacity of a person to do routine tasks. Its test - retest reliability is 0.94. It has an overall score of 80. The LEFS is used to assess patients' initial functioning, progress over time, and outcome, in addition to set practical targets of functioning (15). The LEFS values showed the predicted associations with metrics measuring related variables (Pearson correlation coefficient readings higher than .7) and strong test-retest reliability (intra-class coefficients of correlation varying from .85 to .99) (16).

SPSS version 23 was used for analysis of data. The statistical significance was determined using a significance threshold of p=0.05. The normality of the data was evaluated by using the Shapiro wilks test and parametric or non-parametric test were applied based on the results of normality. .

RESULTS

Table 1 and 2 shows the demographic statistics

Table 1: Age distribution

	N	Mean	Std. Deviation	Minimum	Maximum
Age of the participants	36	30.4444	7.27204	18	40

Table 2: Gender of patient

		Frequency	Percent	Valid Percent
Group A	Males	6	16.7	33.3
	Females	18	33.3	66.7
Group B	Males	10	27.8	55.5
	Females	8	22.2	44.4
Total		36	100.0	

The table 3 shows the descriptive statistics and Wilcoxon Signed-Rank Test statistics of NPRS for group A and group B participants. For group A the table shows that the significance value is below 0.05 i.e., p<0.001, which means that dry needling has reduced the pain score by 3.06 in the patients with hamstring tightness. For group B the table shows that the significance value is below 0.05 i.e., p<0.001, which means that IASTM has reduced the pain score by 3.86 in the patients with hamstring tightness.

Table 3: NPRS Within group analysis(Wilcoxon Signed-Rank Test)

		N	Mean	Std. Deviation	Median	Asymp. Sig. (2-tailed)
Dry needling (Group A	NPRS at baseline	18	5.11	1.07	5.00	**0.00**
	NPRS after 4 weeks	17	2.05	1.29	2.00	
IASTM (Group B)	NPRS at baseline	18	4.88	1.02	4.50	**0.00**
	NPRS after 4 weeks	16	1.31	0.79	1.00	

The table 4 shows the test statistics of the Mann-Whitney U test conducted on NPRS between group A and B. By looking at above table, it can be seen that post treatment values of group A and B have a significance value above 0.05 i.e., (p=0.127), indicating that there is no statistically significance difference in NPRS in both groups. Group A receiving dry needling and group B receiving IASTM showed equal beneficial effects in pain reduction on NPRS in patients with hamstring tightness.

Table 4: Mann Whitney test NPRSacross group A and B

	NPRS at baseline	NPRS after 4 weeks
Mann-Whitney U	143.000	93.000
Wilcoxon W	314.000	229.000
Z	-.640	-1.638
Asymp. Sig. (2-tailed)	.522	.101
Exact Sig. [2*(1-tailed Sig.)]	.563	.127

The table 5 shows the descriptive statistics and Paired Samples t-test of Lower extremity functional scale (LEFS) for group A and group B participants. For group A the data shows that the mean of LEFS at baseline was 54.16 ± 8.06 and the mean of LEFS after 4^{th} weeks was 69.94 ± 4.43 degrees. The table shows that the value of significance is p<0.001, which means that dry needling has improved the functional status on LEFS by 15.78 points in the patients with hamstring tightness. For group B the data shows that the mean of LEFS at baseline was 54.38 ± 7.44and the mean of LEFS after 4^{th} weeks was 72.00 ± 4.33 degrees. The table shows that the value of significance is p<0.001, which means that IASTM has improved the functional status on LEFS by 17.62 points in the patients with hamstring tightness.

Table 5: Lower extremity functional scale (LEFS)Within-group analysis (Paired Samples t-test)

		N	Mean	Std. Deviation	Asymp. Sig. (2-tailed)
Dry needling (Group A)	LEFS at baseline	18	54.16	8.06	**0.000**
	LEFS after 4 weeks	17	69.94	4.43	
IASTM (Group B)	LEFS at baseline	18	54.38	7.44	**0.000**
	LEFS after 4 weeks	16	72.00	4.33	

Table 6 shows the independent samples test statistics on Lower extremity functional scale (LEFS) between group A and B. Looking at the table it can be seen that post treatment values Lower extremity functional scale (LEFS) in group A and B have a significance value above 0.05 i.e., p >0.05, which means that there is no statistically significant difference in the results produced by dry needling in group A and IASTM in group B. Group A receiving dry needling and group B receiving IASTM showed equal beneficial effects in improvement of functional status on LEFS in patients with hamstring tightness.

Table 6: Lower extremity functional scale (LEFS) Between group A and B (Independent Samples t-test)

		N	Mean	Std. Deviation	Asymp. Sig. (2-tailed)
LEFS at baseline	Group A: Dry needling	18	54.16	8.06	**0.93**
	Group B: IASTM	18	54.38	7.44	
LEFS after 4 weeks	Group A: Dry needling	17	69.94	4.43	**0.18**
	Group B: IASTM	16	72.00	4.33	

DISCUSSION

Hamstring is one of the most critical muscle groups to maintain the gait cycle, but it is also one of the most commonly injured(5). The purpose of the research was to see the comparative impacts of IASTM and dry needling on pain and functional status in participants with hamstring tightness.

The present investigation found that both IASTM and dry-needle therapy were useful for minimizing pain, improving functional status. However, no statistically significant distinction in pain alleviation or advancement in lower extremity functional status was detected between the two groups. Dry needling and IASTM were shown to be equally beneficial in relieving pain and promoting functional status in patients with tight hamstring muscle.

In 2023, F Fayyiz et al. reported that IASTM had a substantial impact on pain, function in individuals with knee OA (17). In present study the targeted populated was people with hamstring tightness. But similar results were found in present study. IASTM showed beneficial effects in alleviating the pain and improving functional status.

YT Ma et al. compared the effects of dry needling with oral diclofenac on pain, disability, and range of motion in people with knee OA and reported that for at least six months, the advantages of dry needling and stretching outweigh those of oral diclofenac and stretching (18). MB Mashaherifard et al. demonstrated a substantial difference in the amount of pain felt before and after dry needling. There was also a substantial change in patient performance before and after dry needling (19). A study by QA Khan et al. found that functional DN can enhance hamstring length and improve functional activities (20). In present study the effects of dry needling was compared with IASTM and both technique were found to be equally effective.

Both dry needling and IASTM were shown to be helpful to minimize pain on the NPRS in the current study. In contrast to this, EA Sánchez Romero et al., on the other hand, revealed that using DN in a fitness regimen did not alleviate pain or impairment in those with knee osteoarthritis (21).

Conclusion: Both dry needling and IASTM was found to be efficient in minimizing pain, and improving lower extremity function in patients of Hamstring tightness with posterior pelvic tilt. No statistical significant disparity was found between both group in terms of pain reduction and improvement of lower extremity functional status. Dry needling and IASTM was found to be equally effective in alleviation of pain and improving functional status in patients with hamstring tightness.

Limitations

- Small sample size, which may have limit its generalizability.
- No long term impacts were evaluated.
- Limited time and monetary support.
- No blinding of patients and therapist

Recommendations: Double or triple blinded studies with a larger sample size, determining the long-term effects of interventions are recommended.

Acknowledgement: I would like to thank my research supervisor for her guidance and support.

Funding: None

Competing interest: None.

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