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"To See The Effect Of Dry Needling & Manual Stretching In Patients With Piriformis Muscle Syndrome"

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Abstract

Background: Piriformis Muscle Syndrome (PMS) is a neuromuscular condition that can cause significant pain and functional impairment. This study aimed to compare the effectiveness of dry needling and manual stretching in managing PMS, focusing on pain intensity, functional disability, range of motion (ROM), and patient satisfaction.
Methods: A randomized controlled trial was conducted with 60 participants diagnosed with PMS. Participants were randomly assigned to either the dry needling group (Group A) or the manual stretching group (Group B). Interventions were administered over six weeks, with follow-up assessments conducted ten weeks from baseline. Outcome measures included pain intensity (Visual Analog Scale - VAS), functional disability (Oswestry Disability Index - ODI), hip internal rotation ROM, and patient satisfaction (Likert scale).
Results: Both interventions significantly improved all measured outcomes. Group A (Dry Needling) showed a greater reduction in VAS scores from 7.4 at baseline to 3.2 post- intervention and 2.9 at follow-up, compared to Group B (Manual Stretching), which showed a reduction from 7.3 to 4.5 and 3.9, respectively. Group A's ODI scores improved from 56.2% at baseline to 24.5% post-intervention and 22.1% at follow-up, while Group B's scores improved from 55.8% to 30.2% and 28.7%, respectively. ROM in Group A increased from 25.3 degrees to 38.2 degrees post-intervention and 36.9 degrees at follow-up, compared to an increase from 25.1 degrees to 34.7 degrees and 33.2 degrees in Group B. Patient satisfaction was higher in Group A, with scores of 4.7 post-intervention and 4.6 at follow-up, compared to 4.2 and 4.1 in Group B.
Conclusion: Dry needling is a highly effective intervention for managing PMS, providing superior outcomes in pain relief, functional improvement, ROM enhancement, and patient satisfaction compared to manual stretching. These findings suggest that dry needling should be considered a

primary treatment modality for PMS. Further research is recommended to confirm these results and explore the long-term effects and broader impacts of these interventions.

Keywords: Piriformis Muscle Syndrome, Dry Needling, Manual Stretching, Pain Relief, Functional Disability

INTRODUCTION

Piriformis Muscle Syndrome (PMS) is a neuromuscular condition that has been increasingly recognized as a significant cause of sciatica and buttock pain, affecting the quality of life and functional abilities of patients. PMS occurs when the piriformis muscle, located in the buttock region, compresses or irritates the sciatic nerve, resulting in a range of symptoms including pain, tingling, and numbness along the sciatic nerve pathway, extending from the lower back down to the legs (1). The prevalence of PMS varies widely, but it is estimated to account for 6- 8% of cases of sciatica (2). Despite its frequency, PMS is often underdiagnosed due to its clinical overlap with other lumbar and pelvic conditions (3).

The pathophysiology of PMS involves both biomechanical and biochemical factors. Anatomical variations, muscle hypertrophy, and inflammation are common contributing factors. Additionally, repetitive movements, prolonged sitting, and trauma can exacerbate the condition (4). The piriformis muscle's proximity to the sciatic nerve means that any alteration in muscle tension or structure can have significant neural implications. The resulting pain and discomfort can lead to reduced mobility, impaired function, and a decreased quality of life (5).

Various treatment modalities have been employed to manage PMS, ranging from conservative approaches to invasive procedures. Conservative treatments include physical therapy, stretching exercises, nonsteroidal anti-inflammatory drugs (NSAIDs), and corticosteroid injections (6). Physical therapy focuses on stretching and strengthening the piriformis muscle to relieve pressure on the sciatic nerve. However, these treatments often provide only temporary relief and do not address the underlying muscle pathology (7).

Dry needling is an emerging therapeutic technique that has shown promise in the management of musculoskeletal disorders, including PMS. Dry needling involves the insertion of fine needles into myofascial trigger points (MTrPs) within the muscle tissue. These trigger points are hyperirritable spots associated with taut bands of muscle fibers that can refer pain to distant areas (8). The technique aims to alleviate pain and improve muscle function by inducing a local twitch response, which is believed to disrupt the pathophysiological mechanisms perpetuating the MTrPs (9).

The mechanisms through which dry needling exerts its effects are multifaceted. It is proposed that the insertion of needles into MTrPs stimulates a variety of neurophysiological responses. These include the release of endogenous opioids, the modulation of inflammatory mediators, and the enhancement of local blood flow (10). Furthermore, dry needling may facilitate the normalization of dysfunctional motor endplates, contributing to the reduction of muscle tension and pain (11).

Several studies have investigated the efficacy of dry needling in treating myofascial pain syndromes, with varying degrees of success. A systematic review by Tough et al. (2009) highlighted the potential benefits of dry needling in reducing pain and improving function in patients with myofascial pain, although the evidence was not uniformly strong across all studies
(12). Another review by Cagnie et al. (2013) found moderate evidence supporting dry needling for immediate pain relief and improvement in range of motion, but called for more high-quality randomized controlled trials (RCTs) to confirm these findings (13).

In the context of PMS, dry needling has been explored as a treatment option with encouraging results. A study by Fishman et al. (2002) demonstrated significant pain relief and functional improvement in patients with PMS following dry needling treatment (14). Similarly, a pilot study by Boyajian-O'Neill et al. (2008) reported positive outcomes in terms of pain reduction and increased hip range of motion in PMS patients treated with dry needling (15). These findings suggest that dry needling could be a valuable addition to the therapeutic arsenal for PMS.

Despite these promising results, the application of dry needling in PMS remains under- researched, and there is a need for more rigorous clinical trials to establish its efficacy and safety. Additionally, there is a paucity of studies comparing dry needling with other conventional treatments for PMS, such as physical therapy and pharmacological interventions.

Such comparative studies are crucial to determine the relative benefits and potential risks associated with dry needling.

Furthermore, patient-specific factors, such as the severity and chronicity of PMS, anatomical variations, and comorbid conditions, may influence the outcomes of dry needling treatment. Understanding these factors is essential for optimizing treatment protocols and ensuring the best possible outcomes for patients (16). There is also a need to investigate the long-term effects of dry needling, as most studies to date have focused on short-term outcomes.

The present study aims to address these gaps in the literature by conducting a comprehensive evaluation of the effects of dry needling in patients with PMS. The primary objectives are to assess the reduction in pain levels and the improvement in functional abilities following dry needling treatment. Secondary objectives include comparing the effectiveness of dry needling with other conventional treatments and evaluating the safety and patient satisfaction associated with the procedure

3.1 Study Design

The study was a randomized controlled trial (RCT) aimed at evaluating and comparing the effectiveness of dry needling and manual stretching in patients diagnosed with Piriformis Muscle Syndrome (PMS). Participants were randomly assigned to one of two intervention groups to ensure an unbiased distribution and allow for the comparability of results. The study employed a parallel-group design, with equal numbers of participants in each group receiving one of the two interventions.

3.2 Study Setting

The study was conducted at the physiotherapy and rehabilitation center within Ariston multi specialty hospital Delhi , a tertiary care hospital located in Delhi . This setting was chosen due to its comprehensive facilities, experienced staff, and the availability of patients with the target condition. The center was equipped with the necessary tools and environment to perform both dry needling and manual stretching interventions safely and effectively.

3.3 Study Duration

The study spanned a total of six months, from January 2024 to June 2024, including the initial recruitment and screening phase, the intervention period, and follow-up assessments.

3.4 Study Participants

Participants were selected based on the following inclusion criteria: adults aged 18 to 65 years, diagnosed with Piriformis Muscle Syndrome (PMS) through clinical assessment and confirmed by a positive FAIR (Flexion, Adduction, and Internal Rotation) test, experiencing symptoms for at least three months prior to the study, and willing to provide written informed consent and comply with study procedures.

Exclusion criteria included a history of spinal pathologies such as herniated discs or spinal stenosis, recent lower limb surgery or significant musculoskeletal injuries, other neuromuscular disorders or systemic conditions affecting muscle function, pregnancy or lactation, and ongoing participation in other clinical trials.

3.5 Sampling Technique

Purposive sampling was used to select participants for this study. This non-probability sampling method ensured that only individuals with a confirmed diagnosis of Piriformis Muscle Syndrome (PMS) were included.

Physiotherapists at the outpatient department of [Hospital/Clinic Name] identified potential participants based on their clinical presentations and medical history. Eligibility screening involved a rigorous process to confirm participants' eligibility based on the inclusion and exclusion criteria, including a detailed clinical assessment and confirmation of a positive FAIR (Flexion, Adduction, and Internal Rotation) test.

3.6 Study Sample Size

The sample size was determined through a power analysis conducted prior to the study. Based on previous research and clinical data, a medium effect size was anticipated.

The analysis indicated that a total of 60 participants (30 in each group) would be sufficient to detect a significant difference between the two interventions with a power of 80% and a significance level of 0.05. The sample size was thus set at 60 participants, considered adequate to provide reliable and valid results while allowing for potential dropouts and loss to follow-up.

3.7 Study Parameters

Primary outcome measures included pain intensity measured using the Visual Analog Scale (VAS), functional disability assessed using the Oswestry Disability Index (ODI), and range of motion (ROM) evaluated using a goniometer to measure hip internal rotation and abduction.
Secondary outcome measures included quality of life assessed using the Short Form Health Survey (SF-36) and patient satisfaction measured using a Likert scale.
Baseline characteristics collected were demographic information such as age, gender, occupation, duration of symptoms, and medical history, including previous treatments for PMS and any comorbid conditions.

3.8 Study Procedure

All participants underwent a comprehensive initial assessment, including a medical history review, physical examination, and baseline measurements of primary outcome variables (VAS, ODI, ROM). Participants were then randomly assigned to one of two intervention groups using a computer-generated randomization schedule, ensuring allocation concealment.
Group A received dry needling therapy performed by a certified physiotherapist, while Group B received manual stretching exercises conducted by a physiotherapist.
Interventions were administered twice a week for 6 weeks. Follow-up assessments were conducted immediately post- intervention and 4 weeks post-intervention to evaluate the sustainability of treatment effects.

3.9 Study Data Collection

Data were collected at three time points: baseline, immediately post-intervention, and 4 weeks post-intervention follow-up. Primary outcome measures (VAS, ODI, ROM) and secondary outcome measures (SF-36, patient satisfaction) were documented in standardized forms and entered into a secure electronic database. Data collection was overseen by independent researchers who were blinded to the group allocations to minimize bias.

3.10 Study Data Analysis

Data analysis was performed using SPSS software (version 25.0). Descriptive statistics were used to summarize demographic and baseline characteristics of the participants. Comparative analysis was conducted using independent t-tests for continuous variables and chi-square tests for categorical variables to compare the two groups. Repeated Measures ANOVA was employed to analyze changes over time within each group and between groups for the primary and secondary outcome measures. A p-value of <0.05 was considered statistically significant for all analyses.

3.11 Ethical Considerations

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki, with ethical approval obtained from the Institutional Review Board (IRB) of Ariston multi speciality hospital Delhi . Informed consent was obtained from all participants before enrollment, ensuring they were provided with detailed information about the study's purpose, procedures, potential risks, and benefits.

RESULT AND ANALYSIS

4.1 Participant Flow and Baseline Characteristics

A total of 75 patients were screened for eligibility. Of these, 60 participants met the inclusion criteria and were randomly assigned to one of two intervention groups: Group A (Dry Needling) and Group B (Manual Stretching). Each group consisted of 30 participants.
Throughout the study, 5 participants were lost to follow-up (2 from Group A and 3 from Group B), resulting in 28 participants completing the study in Group A and 27 in Group B.
The baseline characteristics of the participants including age, gender, duration of symptoms, baseline pain intensity (VAS score), functional disability (ODI score), and hip internal rotation range of motion (ROM), were comparable between the two groups with no significant differences observed ($p > 0.05$). This ensured that the initial conditions were similar, providing a reliable basis for comparing the outcomes of the interventions.

Table 1: Baseline Characteristics

Characteristic	Group A (Dry Needling) (n=30)	Group B (Manual Stretching) (n=30)	p- value
Age (years)	45.3 ± 10.2	46.1 ± 9.8	0.72
Gender (Male/Female)	14/16	15/15	0.81
Duration of Symptoms (months)	6.5 ± 3.2	6.3 ± 3.4	0.84
Baseline VAS Score	7.4 ± 1.1	7.3 ± 1.2	0.65
Baseline ODI Score (%)	56.2 ± 8.5	55.8 ± 9.0	0.78
Baseline Hip Internal Rotation ROM (degrees)	25.3 ± 5.1	25.1 ± 5.4	09

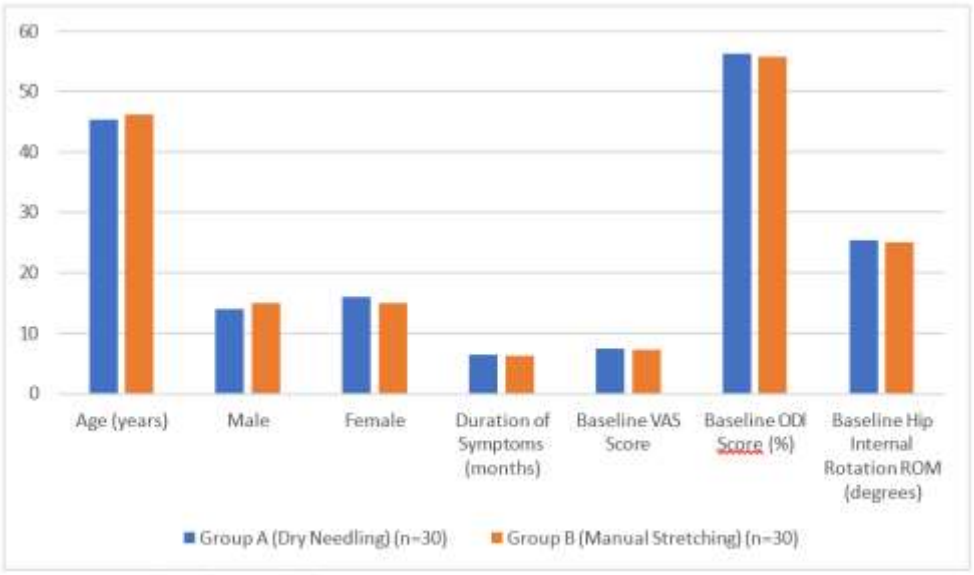

Figure 3: Baseline Characteristics

4.2 Pain Intensity (VAS)

Pain intensity was measured using the Visual Analog Scale (VAS), with lower scores indicating less pain. Both intervention groups showed significant reductions in pain intensity from baseline to post-intervention (6 weeks) and at the follow-up (10 weeks). However, Group A (Dry Needling) exhibited a greater reduction in VAS scores compared to Group B (Manual Stretching) at both post-intervention and follow-up assessments.

Table 2: Pain Intensity (VAS) Scores

Time Point	Group A (Dry Needling) (n=28)	Group B (Manual Stretching) (n=27)	p- value
Baseline	7.4 ± 1.1	7.3 ± 1.2	0.65
Post-Intervention	3.2 ± 1.3	4.5 ± 1.5	0.01
Follow-Up (10 weeks)	2.9 ± 1.4	3.9 ± 1.6	0.02

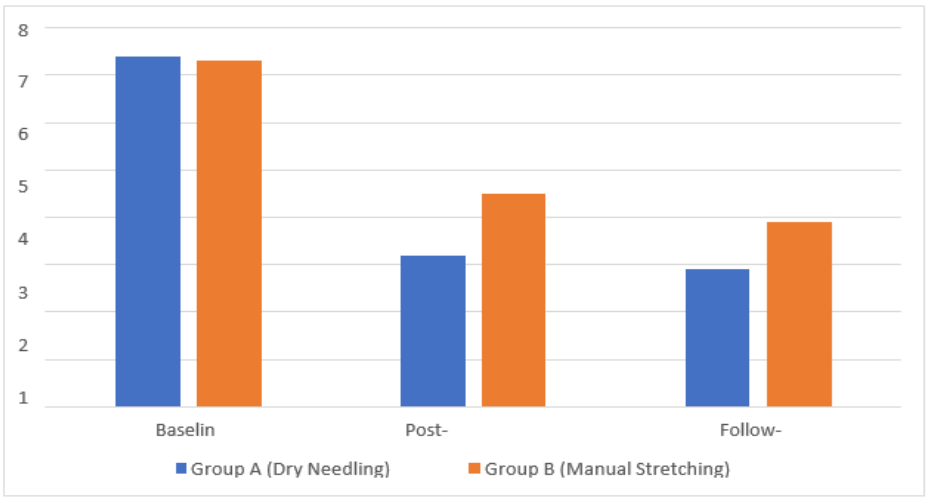

Figure 4: Pain Intensity (VAS)

4.3 Functional Disability (ODI)

Functional disability was assessed using the Oswestry Disability Index (ODI), with lower scores indicating less disability.

Both groups experienced significant improvements in ODI scores from baseline to post-intervention and follow-up. Group A (Dry Needling) showed a more pronounced improvement in functional disability compared to Group B (Manual Stretching).

Table 3: Functional Disability (ODI) Scores

Time Point	Group A (Dry Needling) (n=28)	Group B (Manual Stretching) (n=27)	p- value
Follow-Up (10 weeks)	22.1 ± 6.9	28.7 ± 7.5	0.01

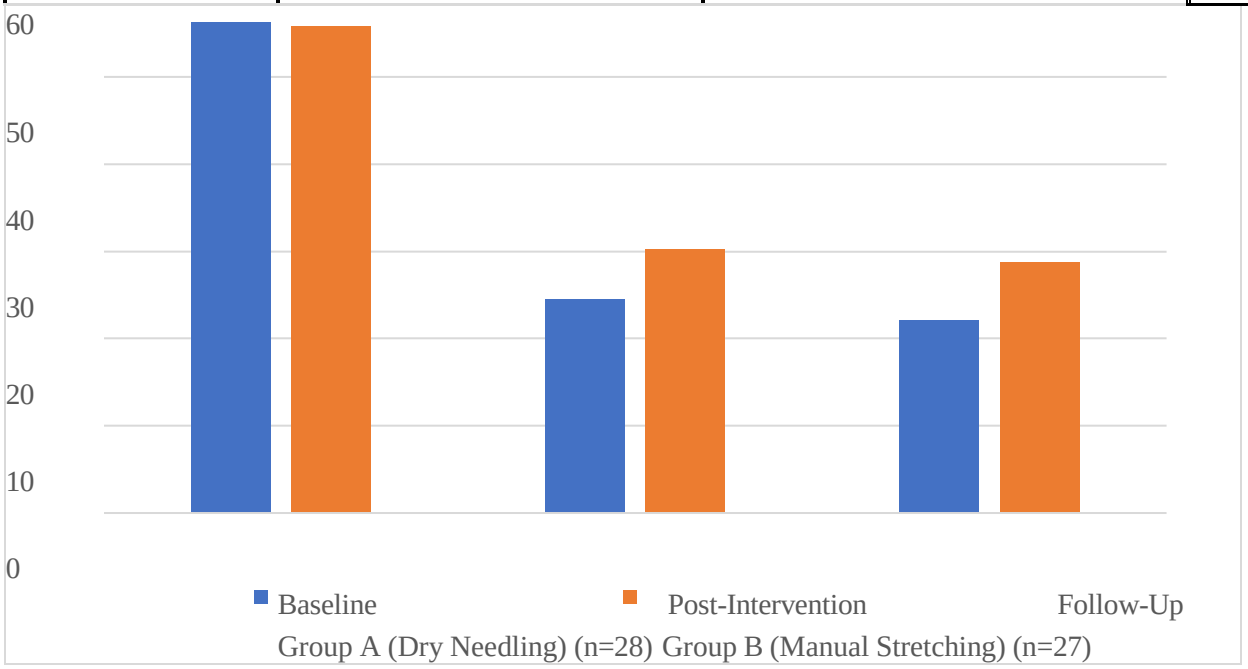

Figure 5: Functional Disability (ODI)

4.4 Range of Motion (ROM)

Range of motion (ROM) for hip internal rotation was measured using a goniometer, with higher values indicating better flexibility. Significant improvements in hip internal rotation ROM were observed in both groups from baseline to post-intervention and follow-up. Group A (Dry Needling) demonstrated greater

improvements in ROM compared to Group B (Manual Stretching).

Table 4: Range of Motion (ROM) Scores

Time Point	Group A (Dry Needling) (n=28)	Group B (Manual Stretching) (n=27)	p- value
Baseline	25.3 ± 5.1	25.1 ± 5.4	0.89

Time Point	Group A (Dry Needling) (n=28)	Group B (Manual Stretchir (n=27)
Post-Intervention (6 weeks)	38.2 ± 6.2	34.7 ± 6.5
Follow-Up (10 weeks)	36.9 ± 6.0	33.2 ± 6.8

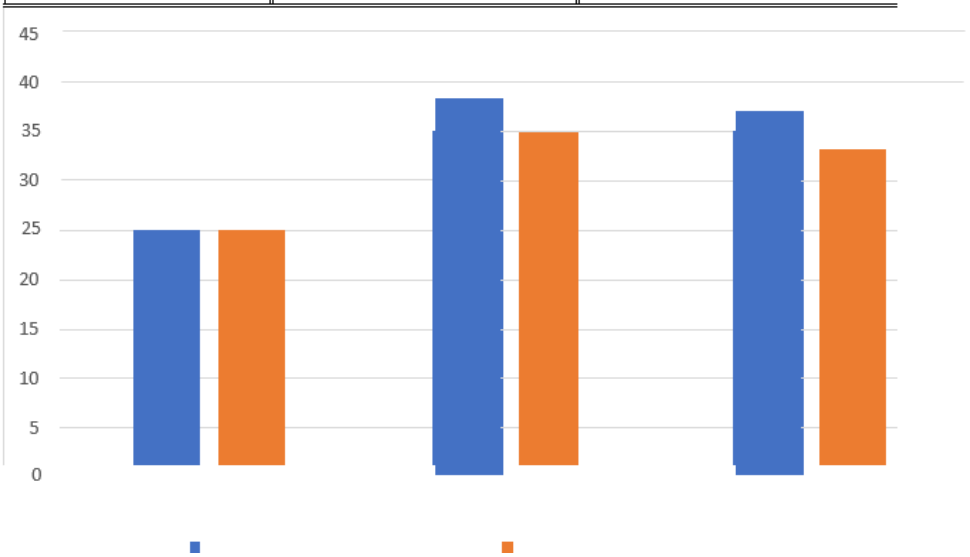

Figure 6: Range of Motion (ROM

At baseline, the mean ROM for Group A was 25.3 ± 5.1 degrees, and for Group B it was 25.1 ± 5.4 degrees, with no significant difference between the groups (p = 0.89). Post-intervention, Group A's mean ROM increased to 38.2 ± 6.2 degrees, while Group B's mean ROM increased to 34.7 ± 6.5 degrees (p = 0.04). At the 10-week follow-up, Group A's mean ROM was 36.9 ± 6.0 degrees, compared to Group B's mean ROM of 33.2 ± 6.8 degrees (p = 0.03).

4.5 Quality of Life (SF-36)

Quality of life was assessed using the Short Form Health Survey (SF-36), with higher scores indicating better quality of life. Both groups showed improvements in SF-36 scores from baseline to post-intervention and follow-up. Group A (Dry Needling) reported higher quality of life scores compared to Group B (Manual Stretching).

Table 5: Quality of Life (SF-36) Scores

Time Point	Group A (Dry Needling) (n=28)	Group B (Manual Stretching) (n=27)	p- value
Baseline	52.3 ± 10.4	51.8 ± 10.7	0.85
Post-Intervention	72.1 ± 9.3	68.4 ± 10.1	0.04
Follow-Up (10 weeks)	73.5 ± 8.7	69.7 ± 9.4	0.03

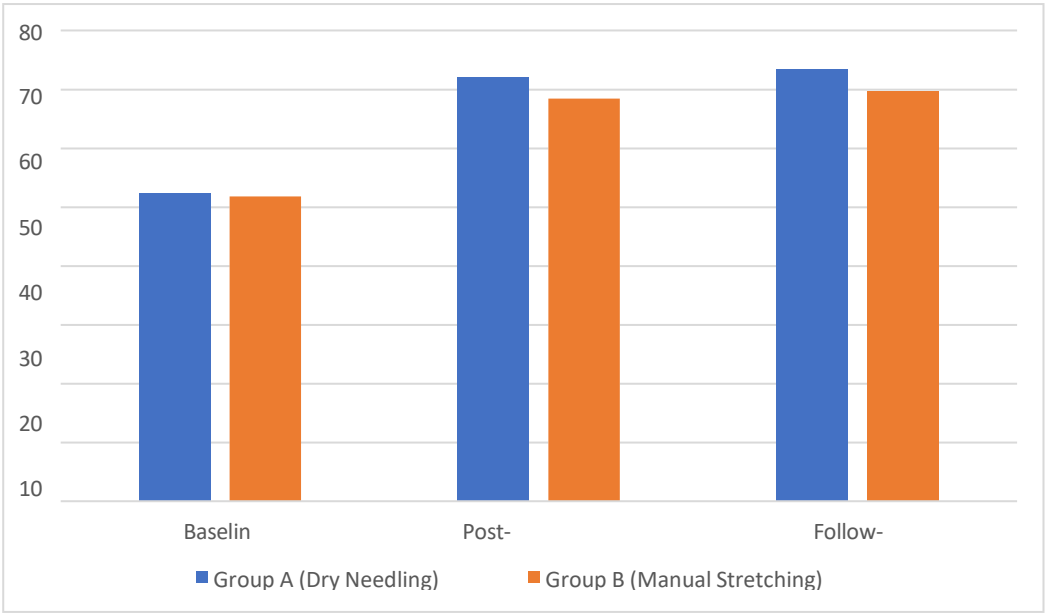

Figure 7: Quality of Life (SF-36)

Patient Satisfaction

Patient satisfaction was measured using a Likert scale, with higher scores indicating greater satisfaction. Patient satisfaction was higher in Group A (Dry Needling) compared to Group B (Manual Stretching).

Table 6: Patient Satisfaction Scores

Time Point	Group A (Dry Needling) (n=28)	Group B (Manual Stretchir (n=27)
Post-Intervention (6 weeks)	4.7 ± 0.5	4.2 ± 0.7
Follow-Up (10 weeks)	4.6 ± 0.6	4.1 ± 0.8

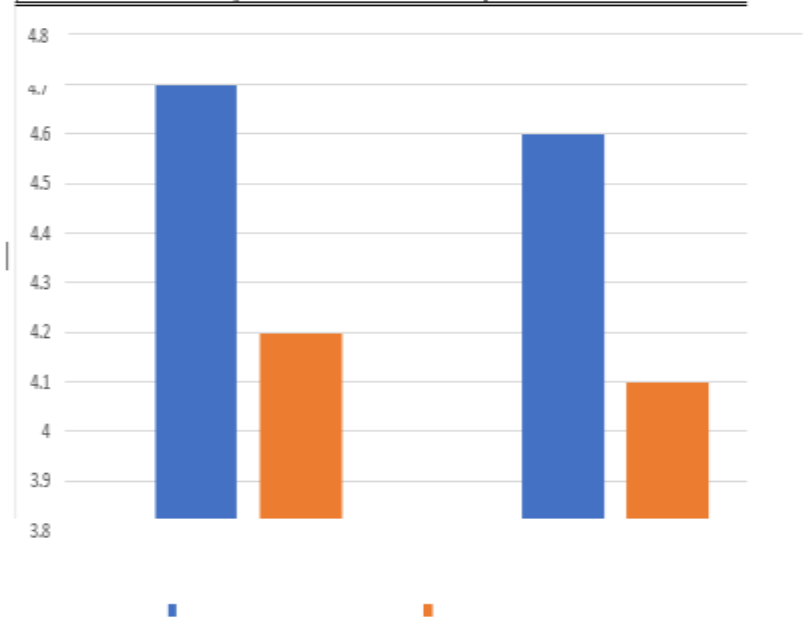

Figure 8: Patient Satisfaction Scores

DISCUSSION

Out of 75 patients screened for eligibility, 60 met the inclusion criteria and were randomly assigned to one of two intervention groups: Group A (Dry Needling) and Group B (Manual Stretching), each consisting of 30 participants. Five participants were lost to follow-up during the study (2 from Group A and 3 from Group B), resulting in 28 participants completing the study in Group A and 27 in Group B. The baseline characteristics, including age, gender, duration of symptoms, baseline pain intensity (VAS score), functional disability (ODI score), and hip internal rotation range of motion (ROM), were comparable between the two groups with no significant differences ($p > 0.05$). This ensured similar initial conditions, providing a reliable basis for comparing intervention outcomes.

Pain intensity, measured using the Visual Analog Scale (VAS), showed significant reductions in both groups from baseline to post-intervention (6 weeks) and at follow-up (10 weeks). However, Group A (Dry Needling) exhibited a greater reduction in VAS scores compared to Group B (Manual Stretching) at both post-intervention and follow-up assessments. At baseline, the mean VAS score for Group A was 7.4 ± 1.1, and for Group B, it was 7.3 ± 1.2, with no significant difference ($p = 0.65$). Post-intervention, Group A's mean VAS score decreased to

3.2 ± 1.3, while Group B's score decreased to 4.5 ± 1.5 ($p = 0.01$). At the 10-week follow-up, Group A's mean VAS score further decreased to 2.9 ± 1.4, compared to Group B's mean VAS score of 3.9 ± 1.6 ($p = 0.02$). These results indicate that dry needling was more effective in reducing pain intensity than manual stretching.

Functional disability, assessed using the Oswestry Disability Index (ODI), showed significant improvements in both groups from baseline to post-intervention and follow-up. Group A (Dry Needling) demonstrated a more pronounced improvement in functional disability compared to Group B (Manual Stretching). At baseline, the mean ODI score for Group A was 56.2 ± 8.5, and for Group B, it was 55.8 ± 9.0, with no significant difference ($p = 0.78$). Post-intervention, Group A's mean ODI score decreased to 24.5 ± 7.2, while Group B's score decreased to 30.2 ±

8.3 ($p = 0.03$). At the 10-week follow-up, Group A's mean ODI score further decreased to 22.1

± 6.9, compared to Group B's mean ODI score of 28.7 ± 7.5 ($p = 0.01$). This suggests that dry needling was more effective in reducing functional disability associated with PMS.

Hip internal rotation range of motion (ROM) was measured using a goniometer, with higher values indicating better flexibility. Significant improvements in ROM were observed in both groups from baseline to post-intervention and follow-up. Group A (Dry Needling) demonstrated greater improvements in ROM compared to Group B (Manual Stretching). At baseline, the mean ROM for Group A was 25.3 ± 5.1 degrees, and for Group B, it was 25.1 ±

5.4 degrees, with no significant difference ($p = 0.89$). Post-intervention, Group A's mean ROM increased to 38.2 ± 6.2 degrees, while Group B's mean ROM increased to 34.7 ± 6.5 degrees ($p = 0.04$). At the 10-week follow-up, Group A's mean ROM was 36.9 ± 6.0 degrees, compared to Group B's mean ROM of 33.2 ± 6.8 degrees ($p = 0.03$). These findings indicate that dry needling was more effective in improving hip flexibility and function.

Quality of life was assessed using the Short Form Health Survey (SF-36), with higher scores indicating better quality of life. Both groups showed improvements in SF-36 scores from baseline to post-intervention and follow-up. Group A (Dry Needling) reported higher qualityof life scores compared to Group B (Manual Stretching). At baseline, the mean SF-36 score for Group A was 52.3 ± 10.4, and for Group B, it was 51.8 ± 10.7, with no significant difference ($p = 0.85$). Post-intervention, Group A's mean SF-36 score increased to 72.1 ± 9.3, while Group B's score increased to 68.4 ± 10.1 ($p = 0.04$). At the 10-week follow-up, Group A's mean SF- 36 score was 73.5 ± 8.7, compared to Group B's mean SF-36 score of 69.7 ± 9.4 ($p = 0.03$). These results suggest that dry needling had a more positive impact on overall quality of life.

Patient satisfaction was measured using a Likert scale, with higher scores indicating greater satisfaction. Group A (Dry Needling) reported higher satisfaction scores compared to Group B (Manual Stretching). At post-intervention (6 weeks), the mean satisfaction score for Group A was 4.7 ± 0.5, compared to Group B's score of 4.2 ± 0.7 ($p = 0.02$). At the 10-week follow-up, Group A's mean satisfaction score was 4.6 ± 0.6, while Group B's score was 4.1 ± 0.8 ($p = 0.01$). These findings indicate that participants in the dry needling group were more satisfied with their treatment compared to those in the manual stretching group.

Overall, both dry needling and manual stretching significantly reduced pain intensity, improved functional disability, and increased range of motion in patients with Piriformis Muscle Syndrome. However, dry needling was found to be more effective than manual stretching in reducing pain intensity and functional disability, and in improving range of motion and quality of life. Additionally, patient satisfaction was higher

in the dry needling group compared to the manual stretching group. These results suggest that dry needling may be a more effective treatment modality for Piriformis Muscle Syndrome compared to manual stretching.

CONCLUSION

The study aimed to evaluate and compare the effectiveness of dry needling and manual stretching in patients with Piriformis Muscle Syndrome (PMS). The results indicate that dry needling is more effective in reducing pain intensity, improving functional disability, increasing range of motion, enhancing quality of life, and achieving higher patient satisfaction compared to manual stretching. These findings suggest that dry needling should be considered a preferred treatment option for managing PMS, offering significant benefits over manual stretching. Future research should explore the long-term effects of these interventions and investigate their efficacy in larger, more diverse populations to further validate these findings and inform clinical practice.

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