

A comparative study between elongation longitudinaux avec decoaption osteo articulaire (ELDOA) and nerve flossing technique (NFT) to improve pain and flexibility in piriformis syndrome – an experimental study

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Abstract

Background: Pain in the hip and buttock areas is the hallmark of piriformis syndrome (PS), a neuromuscular disorder that can radiate to the lower back and thigh. The condition can be brought on by several abnormalities, such as anatomical variations in the piriformis muscle that compress the sciatic nerve or shortening, spasm, hypertrophy, or inflammation of the muscle. There is a 5% to 36% incidence rate of PS in those with low back pain. This study aims to explore the impact of ELDOA (Elongation Longitudinaux avec Decoaption Osteo-Articulaire) and the Nerve Flossing Technique on alleviating pain and enhancing flexibility in individuals with piriformis syndrome. **Methods:** Thirty patients with piriformis syndrome will be split into two groups at random: Group A will receive the ELDOA method, with fifteen participants, and Group B will receive the Nerve Flossing method with fifteen participants. A traditional treatment plan will also be given to both groups. Over four weeks, there will be three therapy sessions every week. Pain levels and flexibility will be evaluated using the Numerical Pain Rating Scale (NPRS) and the piriformis length test at the commencement of the study and after the four-week intervention. **Results:** Within-group analysis revealed a statistically significant ($p < 0.05$) effect for all outcome measures following the intervention. Group A had a pre-mean of 6.4 and a post-mean of 4.53 for NPRS a pre-mean of 26 and a post-mean of 29.466 for the piriformis length test. Group B had a pre-mean of 6.4 and a post-mean of 3.13 for NPRS a pre-mean of 25.866 and a post-mean of 32.266 for the piriformis length test. **Conclusions:** The study's findings show that both the ELDOA and the Nerve Flossing Technique (NFT) are effective in relieving pain and improving flexibility in people with piriformis syndrome. However, the study found that NFT outperforms ELDOA in terms of pain relief and flexibility in the context of piriformis syndrome.

Key words: ELDOA, nerve threading, piriformis syndrome, flexibility

Introduction

Piriformis syndrome (PS) is a neuromuscular disorder defined by chronic discomfort in the hip and buttock areas, which is sometimes accompanied by referred pain in the lower back and thighs. This syndrome is attributed to a spectrum of irregularities affecting the piriformis muscle, a pivotal anatomical component in the buttock area. These irregularities encompass factors such as the muscle's shortening, spasms, hypertrophy, or inflammation. Moreover, variations in the muscle's anatomy can contribute to the compression of the sciatic nerve, exacerbating the clinical manifestations (1).

This ailment is generally characterized by pain and localized tightness in the piriformis muscle area, which surrounds the gluteus. It is described as a severe, aching pain that may or may not be accompanied by sciatica symptoms. Myofascial pain syndrome is the most prevalent symptom of piriformis syndrome, which can be caused by nerve entrapment or discomfort from inside the muscle. This syndrome affects people regardless of their occupation or level of activity, and it is most prevalent in populations in their fourth and fifth decades of life. Piriformis syndrome has been diagnosed in 5% to 36% of persons suffering from persistent low back discomfort (2). Interestingly, women have a higher frequency of PS than males, with a ratio of 6:1. This gender-based disparity emphasizes the importance of considering piriformis syndrome as a potential contributory element, particularly in the comprehensive assessment and management of low back pain in female patients (1).

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Piriformis syndrome poses challenges in clinical settings, occasionally leading to either an excessive diagnosis or insufficient recognition. The complexity arises from the resemblance of its symptoms to various other conditions, such as lumbar radiculopathy, intervertebral disc herniation, and sacroiliac joint dysfunction. Failure to accurately diagnose this syndrome may result in significant issues when left untreated, particularly affecting activities involving prolonged sitting, standing, and walking (3).

Piriformis syndrome (PS) is divided into primary and secondary types. Primary PS, which occurs in less than 15% of patients, is caused by an anatomical issue, such as a bifurcated piriformis muscle, a split sciatic nerve, or an abnormal sciatic nerve route, as described by Pecina et al. in 2008. Secondary PS, on the other hand, occurs in reaction to a precipitating condition, such as buttock microtrauma, which causes soft tissue inflammation, muscular spasms, or a combination of the two, finally culminating in nerve compression. Micro-trauma can also result from overuse of the piriformis muscle, such as prolonged walking or jogging, or from direct compression, ischemic mass effect, and localized ischemia (4).

The diagnosis of Piriformis syndrome (PS) is mostly based on clinical evaluation, emphasizing the importance of a complete medical history and physical examination, as noted in previous research. Tenderness in the sacroiliac joint, larger sciatic notch, and piriformis muscle are all possible clinical findings in a patient with PS. Asymmetrical weakness in the afflicted limb may be observed, as well as positive results from diagnostic tests such as the Piriformis test, Pace and Nagel sign, Freiberg sign, and Beatty test. Exacerbation of pain in the "FAIR" position, as well as restricted medial rotation of the ipsilateral lower extremity, are other notable observations made during the clinical evaluation of people with Piriformis syndrome (1).

The therapeutic approach to piriformis syndrome encompasses a spectrum of interventions, incorporating NSAIDs, analgesics, muscle relaxants, steroids, and physical therapy. In the realm of physical therapy management, a diverse array of treatment modalities is employed. These encompass hot packs, ultrasound, shockwave therapy, soft tissue mobilization, cold packs, and targeted stretching exercises. Additionally, muscle stretches, and the application of various soft tissue manipulation methodologies, including myofascial release, muscle energy techniques, and thrust techniques, collectively serve to alleviate somatic dysfunctions in individuals afflicted with piriformis syndrome (5).

ELDOA is a French acronym that is translated to English as LOADS (Longitudinal osteoarticular decertation stretches). It is an active traction workout for joint space that creates tension in the body's fascia. As a result, it would be defined as a postural self-normalization pedagogy designed to enlarge the space inside a certain articulation. This is accomplished by applying facial stress on the vertebra above the indicated disc (6).

Gay Voyer administers ELDOA throughout Europe. ELDOA stretches help to rectify postural imbalances by enhancing muscle and fascia mobility. Facial stretching is performed by adopting certain postures that target their corresponding spinal segment. It reverses the constriction of short structures by bringing the pivot point to the lower vertebra and moving the higher vertebrae (7).

NFT is a series of quick mobilizations that are used to gradually realign strained nerves. It includes the simultaneous movement of two joints that, in turn, stretch the neural bed and induce tension in the nerves and shorten it, in that order. Pain relief is achieved by NFT through a variety of mechanisms, including decreased supraspinal sensitization, removed interneural edema, increased nerve excursion, improved blood flow to the nerve, allowed venous return, and decreased ischemia discomfort (8).

Numerous methodologies exist for enhancing both the pain management and flexibility of the piriformis muscles, encompassing techniques like stretching, Muscle Energy Technique (MET), Elongation Longitudinaux Avec Decoaption Osteo Articulaire (ELDOA), and Nerve Flossing Technique (NFT).

Presently, there is a lack of conclusive evidence comparing the efficacy of ELDOA to that of NFT. Consequently, this study is specifically structured to investigate and analyze the respective effects of ELDOA and the Nerve Flossing Technique on the amelioration of pain and enhancement of flexibility in individuals afflicted by piriformis syndrome

Materials and Methods

The study was conducted after obtaining institutional ethical authorization. The participants were taken from various hospitals of Ahmedabad.

Participants

Thirty individuals diagnosed with piriformis syndrome will be systematically assigned to two distinct groups. Group A, consisting of 15 participants, will be subjected to the ELDOA technique, while Group B, also comprising 15 individuals, will undergo the Nerve Flossing Technique. Specifically, In addition to these targeted interventions, both groups will be administered a conventional treatment protocol. The criteria for inclusion in the research involve individuals aged between 25 and 45 years, encompassing all genders. To meet eligibility, participants must exhibit a positive response in at least three of the following tests: Piriformis test, Beatty test, Freiberg test, FAIR test, and demonstrate the presence of the Pace & Nagel sign. Furthermore, individuals with a piriformis length less than 40 degrees are considered suitable candidates for participation in the study. The exclusion criteria for the research encompass individuals with any pathology or recent injury in the vicinity of the hip, knee, and sacroiliac joint. Additionally, participants experiencing pain attributed to neurological, spinal, or pelvic origins are excluded. Individuals with a history of trauma or pathology around the cervical spine are also not considered eligible for participation (9,10).

Study design

The participants were distributed using a simple random sampling approach. Group A, consisting of 15 participants, will be subjected to the ELDOA technique, while Group B, also comprising 15 individuals, will undergo the Nerve Flossing Technique. The treatment sessions will be conducted with a frequency of three times per week, spanning duration of four weeks. Assessment of pain levels and flexibility will be executed utilizing the Numerical Pain Rating Scale (NPRS) and the piriformis length test at the initiation of the study and upon the completion of the four-week intervention period.

Group A ELDOA group

Group A were treated with ELDOA. Each patient assumed a long-seated position, wherein the sound leg was extended at the knee with the foot in a supinated orientation, while the affected leg underwent internal rotation accompanied by knee flexion and a pronated foot. The arms were extended straight, externally rotated, and reached forward. The spine maintained an upright posture, ascending towards the ceiling. The pelvis experienced a slight posterior rotation, and the head remained straight and in a neutral position (9).

While maintaining this specific posture, the internal rotation of the affected leg was systematically adjusted, either increased or decreased, until the patient perceived a discernible stretch in the piriformis muscle. This particular position was sustained for duration of one minute, interspersed with a 15-second rest interval. A total of five repetitions or sessions were conducted (9).

Group B Nerve flossing group

Group B were treated with Nerve Flossing Technique. The Nerve Flossing Technique was actively administered with the participant seated in a chair. The procedure involved the participant extending the knee of the designated lower extremity backward alongside the chair, striving for maximal flexion, while simultaneously flexing the neck. This dual flexion was sustained for duration of 5 seconds. Subsequently, the participant proceeded to extend both the neck and the knee of the specified lower extremity, followed by abduction and hip flexion until the onset of pain, cautioning against pushing beyond this threshold. The elongated position was maintained for an additional 5 seconds (10).

This sequence of the Nerve Flossing Technique was iterated 15 times, organized into 3 sets, with a 5-minute interval between each set (10).

Conventional

Additionally, a conventional protocol will be provided to both groups which involves application of moist heat pack over piriformis muscle for 10 minutes and a stretching of piriformis muscle is done for 30 seconds hold for 3 times and strengthening exercises for hip abductors; 3 sets;10 times per set; with the use of weight cuffs (1).

Statistical analysis

The SPSS version 25 was used for the statistical analysis of the study. Firstly, normality of data is checked using Shapiro-Wilk test. Student paired t-test and independent t-test was applied for comparing the mean and standard deviation of the inter and intra group analysis. The confidence interval for the study was kept at 95% and significance level was kept at <0.05. Table 1 suggests means of age difference for both groups. Group A mean was 33 and Group B mean was 32.93.

Results

Table 1 suggested mean age difference for both group. Group A mean age was 33 and Group B mean age was 32.93.

Table 1. Mean age distribution for both groups

Age	Group A	Group B
Mean	33	32.93
SD	6.094	5.762

Table 2 suggested that group A consisted of 6 males and 9 females and group B consisted of 7 male and 8 female.

Table 2. Gender distribution for both groups

Gender	Male	Female
Group A	6	9
Group B	7	8

Table 3 which suggested that Within groups analysis of groups A and B suggested statistically significant differences in all the outcome measures. Pre-post analysis of data shows p value less than 0.05.

Table 3. Within groups analysis of outcome measures

Variables	Mean	Std.deviation	P
NPRS pre-A	6.4	1.298	<0.001
NPRS post-A	4.53	1.407	
NPRS pre-B	6.4	1.121	<0.001
NPRS post-B	3.13	1.355	
ROM pre-A	26	1.732	<0.001
ROM post-A	29.466	2.231	
ROM pre-B	25.866	1.846	<0.001
ROM post-B	32.266	2.576	

Table 4 suggests that Between-group analysis of groups A and B suggested statistically significant difference in all the outcome measures post intervention.

Table 4. Between-group analysis of outcome measures

Outcome Measure	Group A			Group B		
	Mean	SD	P value	Mean	SD	P value
NPRS	4.53	1.407	<0.001	3.13	1.355	<0.001
ROM	29.4667	2.231	<0.001	32.26	2.576	<0.001

Discussion

Piriformis syndrome is a complex neuromuscular illness caused by inflammation or irritation of the piriformis muscle, which then leads to sciatic nerve neuritis. Affected people usually experience discomfort in the lower back, hip area, and posterior thigh, which can radiate to the leg and lateral part of the foot. Concomitant symptoms encompass a burning sensation, numbness, ambulatory difficulties, and impediments in the execution of routine activities of daily living (11).

A study involving thirty patients diagnosed with piriformis syndrome will employ random assignment to two groups. Group A, consisting of 15 individuals, will undergo the ELDOA technique, while Group B, also comprising 15 participants, will receive the Nerve Flossing Technique. Both groups will concurrently receive conventional treatment. Treatment sessions, occurring three times a week, will span four weeks. The evaluation of pain levels and flexibility will be conducted using the Numerical Pain Rating Scale (NPRS) and the piriformis length test at the study's commencement and upon completion of the four-week intervention.

SPSS version 26 was used to calculate the study's results. The mean and standard deviations of the inter- and intra-group analyses were compared using the student-paired t-test and the independent t-test. Out of the total participants in Group A, 6 were males and 9 were females while in Group B, 7 were males and 8 were females. The mean age of participants in Group A was 33

while in Group B was 32.93. The mean pre+ post for a range of motion in group A is 26.00+29.47, and the mean pre+ post for NPRS is 6.40+4.53. In group B, the mean pre+ post for a range of motion is 25.87+32.27, while the mean pre+ post for NPRS is 6.40+3.13. There was a statistically significant difference between the pre-and post-values for both groups, as indicated by the p-values of 0.0001 for all the variables.

The ELDOA method comprises primarily postural exercises that can be imparted to patients. These exercises entail the deliberate creation of facial tension at specific vertebral segments, thereby inducing separation between the vertebral spaces. This separation, in turn, results in heightened blood flow and increased disc hydration. Additionally, these postural exercises contribute to muscle strengthening and enhance proprioception (12).

Momena Shahzad et al. determined that the Elongation Longitudinaux Avec Decoaption Osteo Articulaire (ELDOA), also known as Longitudinal Osteo Articular Decoaptation Stretching (LOADS), is a manual physical therapy tool and myofascial stretching method. Its major goal is to aggressively decompress certain anatomical areas by generating a separate space, allowing for structural realignment through fascial tension repair. On a local level, ELDOA improves muscle tone to correct posture, while on a larger scale, it refines kinetic awareness of the myofascial chain and promotes tension normalization within the myofascial system (6).

Clement A. reported that the pain could be significantly decreased while applying ELDOA for patients with disc pathologies in musicians when assessed pre and post-treatment (13).

According to Himani Vartak et al., when the Nerve Flossing Technique is performed dynamically, the consequent pumping action helps to improve venous return, disperse edema, and relieve pressure inside the perineurium. This process diminishes sensitivity and reinstates functionality, thereby mitigating the perceived threat of injury. Consequently, there is a reduction in the likelihood of ion channel upregulation within the dorsal root ganglia and the central nervous system, concurrently limiting the potential for alterations in the dorsal region and the brain. According to the Gate Control Theory, activation of mechanoreceptors in the joint capsule and surrounding tissues suppresses pain signals at the spinal cord level. Furthermore, the theory proposes that regulated movement of nerves within pain-free ranges might help alleviate compression, tension, and friction on the nerves, hence lessening their mechanosensitivity (8).

In their investigation, Anikwe EE discovered that the Nerve Flossing Technique reduced discomfort and improved hip range of motion. The dynamic fluctuation in neuronal pressure caused by the NFT, which is characterized by stretching at one end and relaxation at the other, is the mechanism underlying this effect. According to the findings, this dynamic process results in the evacuation of any intraneural edema that may exist. The observed increase in range of motion (ROM) is due to hamstring muscle elongation, which may be caused by repetitive knee extension or a decrease in pain severity. This may have hindered participants from attaining their maximum range of motion (14).

According to Bonser et al., when neurodynamic slider techniques targeting the sciatic nerve were compared with static conventional stretching, the results showed that the slider approach was more successful in increasing hamstring flexibility (15).

The research's limitations include its small sample size, the lack of a long-term follow-up following the trial, the difficulty of the patient assuming the ELDOA posture, and the fact that only two outcomes were evaluated. Future research on other populations with a range of ages as well as on different muscles or nerves is advised.

Conclusion

According to the study's findings, Nerve Flossing Technique (NFT) is superior than ELDOA in terms of reducing discomfort and increasing range of motion in patients with piriformis syndrome.

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