

The Effects of Dry Needling in Combination with Physical Therapy on Improvement of Pain and Hip Internal Rotation Range in Patients with Piriformis Syndrome

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Abstract

Introduction: Piriformis syndrome may be a source of low back, buttock pain or sciatica, due to existence of myofascial trigger point in piriformis muscle. The aim of this study was to investigate the immediate effects of dry needling on improvement of pain and hip internal rotation range in piriformis syndrome. **Materials and Methods:** 40 athletes participants with piriformis syndrome were randomly divided into two groups, experimental group (conventional physiotherapy besides dry needling) (n=20) and control group (conventional physiotherapy) (n=20). 5 sessions of conventional physiotherapy was performed for both groups, but dry needling was performed at the end of 1st, 3rd and 5th sessions. Hip internal rotation and pain were respectively measured by goniometer and visual analog scale. All the data were measured before applying intervention, and at the end of odd sessions. The repeated measures ANOVA with between subjects factor was used to analyze the data and significant level was set at $P<0.05$. **Results:** The results showed that there were significant reduction in pain and significant increase in hip internal rotation at different time in two groups ($P<0.05$) and this differences was more apparent in the experimental group. **Conclusion:** The result of this study showed that, the use of dry needling plus conventional physiotherapy has a superiority immediate effect on pain and hip internal rotation range.

Keywords: Piriformis syndrome, Dry needling, VAS, Hip internal rotation

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Introduction

Piriformis syndrome (PS) is a neuromuscular disorder that is caused by prolonged or excessive contraction of the piriformis muscle (PM) or it is occurred by entrapment of sciatic nerve in piriformis region (1). The symptoms which include pain in hip or buttock region and the pain is increased by walking, sit to standing and stair climbing and during lower limb functional activities (2). PS may affect individuals of lifestyles with all the different occupations. This syndrome is more prevalent among women due to the wider Q angle in the pelvis of women (3).

PS may be caused by trauma that affects the pelvis, anatomic abnormalities of the piriformis muscle, leg length discrepancy and Piriformis myositis (4). One of the most common causes of PS might be associated with spasm in piriformis muscle that may

further develop myofascial trigger points in response to changed muscle demands (5). Myofascial trigger points are hyperirritable nodules which have been located within a taut band of skeletal muscle and produce local pain, sensitivity and radiate pain along the sciatic nerve root (6). Trigger points can be detected by palpation on the belly of piriformis muscle or at the level of greater sciatic notch (7). There are some special tests to clinical diagnosis of PS like Freiberg's test, FAIR test, Lasegue test and Beatty test (8, 9). The pharmacological management of PS includes NSAIDs, muscle relaxants and non-pharmacological management includes diverse manual therapy techniques, stretching of piriformis muscle and kinesiotaping (4). Cold therapy, heat therapy ultrasound and electrical current have been suggested as additional modalities to decline the pain relation to stretching exercises which have been applied to a tight piriformis muscle (4).

Table 1. characteristics in baseline (n=20)

characteristics in baseline	Experimental group	Control group	P-value
Age (year)	26.5 ± 1.4	27.6 ± 5.9	0.2
Weight (Kg)	72.5 ± 3.7	74.6 ± 1.2	0.11
Height (m)	176.7 ± 8.3	177.5 ± 1.8	0.17
BMI (kg/m ²)	23.1 ± 1.25	23.1 ± 3.44	0.2

However, dry needling (DN) with the minimal invasion is used to deactivate the myofascial trigger points of different regions of muscles and helped to decrease the local pain (10). DN is a treatment procedure and it is including a thin filiform needle that directly inserts into myofascial trigger points (11). As stated, people from different groups involved in piriformis syndrome and one of them is athletes. In field of athletes, the ability to train, compete and recover optimally plays a vital role in the athlete's success. During 2004 Olympic Games in Athens, in visit of therapeutic teams from Olympic village found that current pathology in athletes were myofascial pain and muscle spasm at 32.5% (12). For this reason, physiotherapists used the dry needling to clinical management in many of countries and decrease in time of athletes suffering from trigger points (13).

Tizdale in review study was investigating the effect of dry needling on myofascial of trigger points in athletes. The results showed that dry needling has induced the pain reduction, increased the life quality and range of motion and if it uses along with stretch training, it will have positive effects on pain and function (14). As regards, effect of muscle stretch on remedy of stiffness or myofascial spasm require to long time (15) and immediate effects of dry needling on pain reduction and on the other hand, need of athletes to maintain their physical fitness and faster return to sports fields, it is necessary to obtain the increase of range of motion and pain reduction is essential for these subjects. Also, limited studies in relation to effect of dry needling on piriformis syndrome were done. Therefore, we were investigating the immediate effects of dry needling on improvement of pain and range of hip internal rotation in piriformis syndrome.

Materials and Methods

This study was a clinical trial and carried out at Sinuhe physical therapy center in Tehran. Statistical society of present study included healthy men athletes who had just chronic pain in region of piriformis (piriformis syndrome). The participation were evaluated and examined by specialist orthopedist to confirm the piriformis syndrome and trigger points. Inclusion criteria to study included being athlete, lack of use of steroids

and non-steroids (NSAIDs), absence of metabolic and neurologic diseases. Also, patients who had a similar symptomology with piriformis syndrome, such as stenosis, disc herniation and facet arthropathy were excluded. Among them, 40 participants in 18-30 years old were selected by simple sampling and were examined by these special tests; The FAIR, Freiberg, lasegue and beatty test. The patients should have been positive at least in three special tests of all tests. For definition of myofascial trigger point in piriformis syndrome, we palpated taut band in piriformis muscle just based on anatomical landmark. They randomly allocated into two groups, conventional physiotherapy with stretching plus dry needle group (experimental group, n=20) and conventional physiotherapy with stretching group (control group, n=20). Conventional physiotherapy and stretching exercise was performed for five sessions (three sessions in a week) but experimental group received dry needling at the end of 1th, 3th and 5th sessions, too. Conventional physiotherapy included heat, interferential and ultrasound therapy (16, 17), stretching exercise consisted of hip flexion 90 degree, hyper horizontal hip adduction and hyper internal hip rotation, 14 repetition and 20-30 seconds (18) for every movement.

Fire test (flexion, adduction and internal rotation)

The participant laid in the side-lying position with the hip flexed to an angle of 60 °, and the knee flexed to an angle of 60 ° to 90 °, hip was passively stabilized, internally rotated and adducted by examiner. If the pain is felt, the test result was positive (9).

Freibergue test

If the pain was felt on forced internal hip rotation with flexed knee in a passive and prone position, the test result was positive (9)

Lasegue test

In a supine position, the examiner lifts the patient's painful leg with the hip flexion of 90 degree. The examiner asked participant to perform the knee extension. The pain was indicative a positive result (9).

Beatty test

The patient lay on the painful side and elevated the painful leg and kept it. Deep buttock pain was indicative a positive result (4).

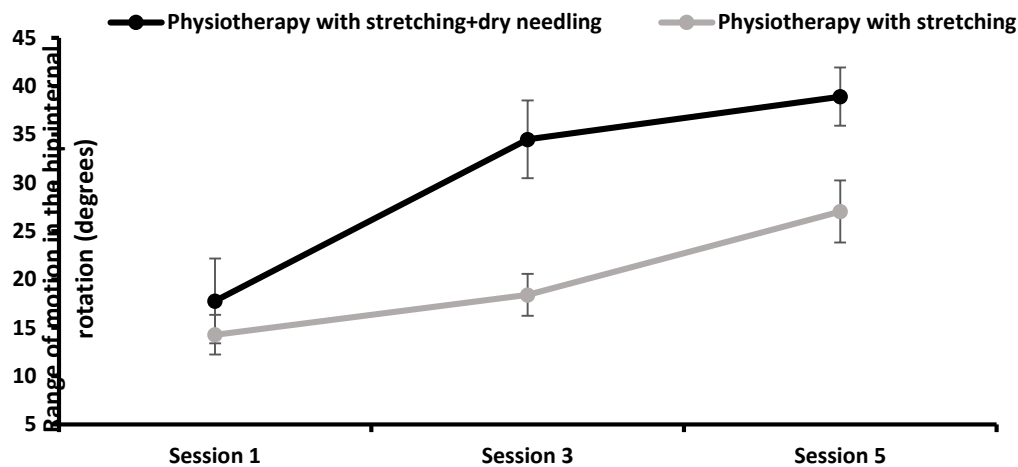


Figure 1. Mean (SD) of hip internal rotation in experimental and control groups

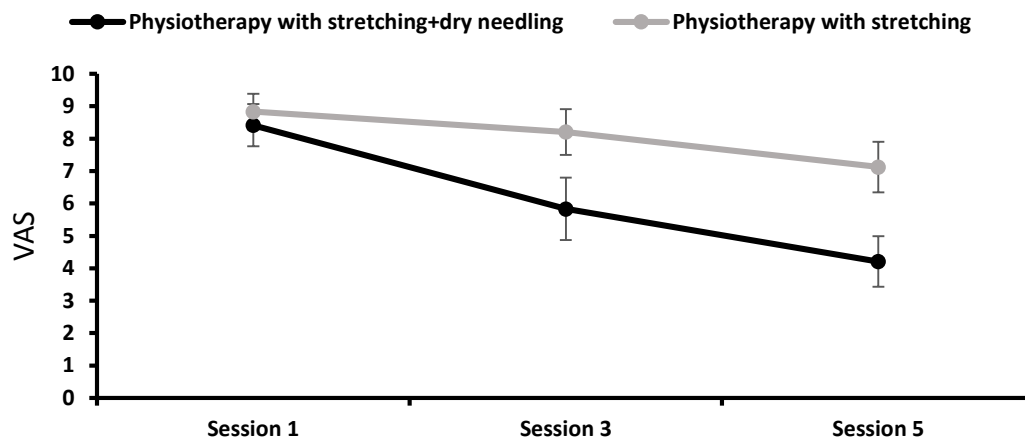


Figure 2. Mean (SD) of VAS in experimental and control groups

Dry needling protocol

All the dry needling was performed by a similar examiner. Tight points or taut band were identified by palpation. The patient lay on the abdomen. The examiner found the landmarks of greater trochanter and sacrum in S2, S3 and S4 and he inserted the needle vertically to the surface of the trochanter, from the sciatic notch toward the pubis symphysis, directly to the stiffness points. Dry needling were performed deeply by a needle with the 0.30 mm in diameters and 65 mm in length (Seirin Corp, Shizuoka, Japan) (19).

Outcome measurement

Demographic data (e.g., name, age, sex, address, occupation) were obtained at baseline from patient interview and recorded on a data collection sheet (Table 1). The following outcomes, pain measurement and measurement of hip internal rotation were measured. Hip internal rotation and pain were respectively

measured by goniometer and visual analog scale (VAS). All the data were measured at the end of 1th, 3th and last intervention sessions.

Pain measurement

The examiner asked a participant to sit on the chair. The pain intensity was measured by the Visual Analogue Scale (VAS) which consisted of horizontal line from zero to ten and a patient circled his response. Score of 0 means no pain and score of 10 means worst imaginable pain.

Measurement of hip internal rotation

The examiner measured the hip internal rotation in the prone position. He asked the participant to bend his knee to 90 degree. The axis of a goniometer was placed at the center of the knee joint, and the arms of the goniometer were aligned parallel to the long axis of the tibia then participant moved his

leg outwardly without moving the pelvis and we stabilized the pelvis by belt. Stationary arm of the goniometer kept on the start point while moving arm was aligned to the long axis of tibia at the end range of internal rotation; this range was recorded as the hip internal rotation (4).

Statistical analysis

A repeated measure ANOVA with between group factors was used in order to compare the changes of groups. If significant differences was observed, Bonferroni post hoc test were utilized to determine this difference. We analyzed all the data using SPSS (Version 16) and statistical significance was set at $P < 0.05$.

Results

The data of range of hip internal rotation and VAS (Mean \pm SD) at end of the first to the fifth sessions were shown in Figures 1 and 2, respectively. Statistical analysis of the data showed that changes in the range of hip internal rotation and VAS had a significant difference in experimental group, respectively ($F_{2, 86} = 58.3$, $P < 0.001$ and $F_{2, 86} = 31.2$, $P < 0.001$, respectively), which indicated the significant interaction between conventional physiotherapy with stretching and dry needling. These results show the effective role of convectional physiotherapy in addition stretching and dry needling in increasing the range of hip internal rotation and decreasing the pain (Figures 1 & 2).

Discussion

The aim of this study was to investigate the immediate effects of dry needling on improvement of pain and region of hip internal rotation in piriformis syndrome. There were significant improvements in pain from 8.41 points to 4.20 points on VAS after one period of conventional physiotherapy with stretching by dry needle and hip internal rotation has increased from 17.79 to 98.92. Experimental group in 5th session showed most increase of hip internal rotation and most reduction of pain in comparison to the first session of the rehabilitation program. Therefore, the use of dry needling along with physiotherapy modalities and stretching are impressive in immediate improvement of pain and region of hip internal rotation in piriformis syndrome. According to our knowledge, there are limited studies in relation to effectiveness of dry needling on immediate improvement of pain and region of hip internal rotation in piriformis syndrome. Dry needling has been shown to influence pain by affecting the biochemical environment and local blood flow surrounding the myofascial trigger point (20). Dry needling results in activate of Enkephalinergic interneurons in the dorsal horn of the spinal cord

and it thus reduces the pain (21). In other words, dry needling has been able to decrease the stiffness of muscle and activate the inhibitor control system (22). Shah *et al.* found that dry needling significantly decrease the concentration of P substance and calcitonin associated with peptide (23). They also indicated that inserting the needle into the tissue and trigger points enhanced the tissue circulation in that region. Therefore, the result of dry needling implication on trigger points was pain reduction that was in agreement with the results of this study (24). Cagnie *et al.* demonstrated that one session of dry needling intervention of trigger points within the upper Trapezius muscle, caused the increase of blood flow and blood oxygen saturation in vicinity of trigger points within 15 min after removal of the needle (25). In opposite to the result of present study about the effect of dry needling on the region of internal hip rotation, Huguenin *et al.* investigated the effect of dry needling on range of motion SLR, internal leg rotation and pain muscle of stiffness gluteus in 59 men runner. The subjects were divided in two groups, experimental (dry needling) and control (placebo needle) groups. The data of range of motion and VAS were collected immediately before, immediately and after 24 h and 72 h after intervention. Magnetic resonance imaging showed normal hamstring musculature in most subjects of SLR and hip internal rotation of both groups reminded constant at all time. Probably, the implementation of a dry needle alone is one of the reasons for not changing the range of motion. But VAS evaluation of pain and gluteal tightness after running showed improvement of pain, immediately after intervention in both groups and it was maintained for 24-72 hours (26). On the other hands, muscle stretching increase the muscle flexibility and region of motion. After muscle stretching, resistance of muscle declines and a viscoelastic response has been caused (27).

The muscle contraction which mediated by 10 to 20% of the maximal contraction strength of the activated muscles, activates the contractile receptors within the muscle and due to their activation, periaqueductal grey matter in mid brain, non-opioids serotonergic pathway and descending inhibitory neuroandrogenic pathway are activated, finally, individual's pain decreases (28). Physiotherapy modalities with stretch also decreased the pain and region of motion; it has been argued that increasing blood flow into region helped to remove the pain inducing substances. (22). Likely, more effective effect of physiotherapy modalities with strengthening and dry needle compare to physiotherapy modalities with strengthening, are the synergistic effect of these interventions on the treatment of trigger points in piriformis syndrome. Another research showed that use of dry needling along with stretching training were more effective than stretching on pain reduction after 3 weeks follow up (29). In

agreement with the results of this study, Rayegani *et al.* compared the effect of dry needling (one session treatment) with physiotherapy modalities which consisted of 10 sessions treatment with HP, US, TENS and strength on remedy of upper myofascial pain Trapezius muscle. Both methods reduced the pain intensity and improved the quality of life indices but dry needling method was more effective because of the need for less time and cost (30). In attention to the results, performing both methods have improved the pain and range of hip internal rotation and released of trigger points in piriformis syndrome but use of dry needling have improved the pain more quickly and the range of motion.

Conclusion

Use of dry needling plus conventional physiotherapy has a superiority immediate effect on pain and hip internal rotation range.

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All authors made substantial contributions to conception, design, acquisition, analysis and interpretation of data.

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