The Effects of Dry Needling and Physical Therapy on Improvement of Pain in Patients with Piriformis Syndrome

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Abstract

Background: Piriformis syndrome may be source of low back, buttock pain or sciatica. The purpose of this Study is to determine the effectiveness of dry needling (ND) and classical physiotherapy (PT) in the management of pain in patients with Piriformis Syndrome (PS).

Methods: A cross-sectional study was conducted 58 patients with PS were divided to two groups classical PT (n=29) and DN (n=29). 6 sessions performed for both groups, the pain measured before the first session and after each session at the end of both program, both groups were compared to determine which of them is more effective.

Results: The result showed that there was significant reduction of pain in both classical PT and dry needling groups. Paired-Sample T.Test indicated significantly difference mean ratings of pain affect from session 1 compare to session 6 for classical physical therapy $T_{(28)} = 14.065$, p = 0.000. in other group Paired-Sample T.Test also showed significantly difference mean ratings of pain affect from session 1 compare to session 6 for dry needling therapy $T_{(28)} = 11.119$, p = 0.000.

Conclusion: Based on the results of statistical data analysis, it is concluded that both classical physical therapy and dry needling therapy have significant effect in treating and managing the pain in patients with piriformis syndrome and no significant difference was observed between the results of both groups.

Keywords: Piriformis Syndrome, classical physical therapy, dry needling therapy.

1. Introduction

1.1 Introduction:

Piriformis syndrome is a neuromuscular condition that is considered by a group of symptoms that includes hip and gluteal pain (Norbury et. al., 2012). The referred pain is often raised down from the back of the leg, every so often into the medial foot (Kirschner, Foye & Cole, 2009). It is normally associated with tingling and numbness in posteromedial pain in the lower leg, which contains the popliteus, flexor digitorum longus, flexor hallucis longus, and tibialis posterior muscles (Taylor & Pan, 1998).

The piriformis syndrome can be caused by a variety of reasons, including trauma and anatomical anomalies (Vij et. al., 2021). Despite the fact similar appearance to a lumbar radiculopathy, this peripheral neuritis is presumed to be the result of an abnormal piriformis muscle or compression/ irritation of the sciatic caused by compression of the sciatic nerve by the piriformis muscle (Robinson et al., 1976; Hopayian, 2012).

Understanding the anatomy, physiology, and connection between the piriformis muscle and the sciatic nerve is necessary to identify piriformis syndrome. Consequently, piriformis syndrome is often difficult to diagnose, assumed its similar demonstration to lumbar disc herniation, stenosis, radiculopathy, and neurogenic pain. Because of this, piriformis syndrome is a neuromuscular condition that remains poorly understood and often misdiagnosed (Boyajian-O'Neill et. al., 2008). To diagnose PS, studies of the usefulness and frequency of positive signs/symptoms on physical examination are hampered by the absence of a gold standard. Physical signs however, may be grouped into those which are generally positive for sciatic nerve "irritation", and those which are thought to be more specific to PS (Miller, et. al.2012).

Anatomically, piriformis muscle has the shape of a flat pyramid and originates from the anterior surface of the second through the fourth sacral vertebrae,

sacrotuberous ligament, and the superior margin of the greater sciatic notch (Michel et al., 2013). It exits transversely through the greater sciatic notch and inserts on the superior greater trochanter (Cass, 2015). The sciatic nerve can be impacted and hurt if the piriformis muscle is swollen or irritated. Typically, PS manifests as sciatic-nerve-distributed low back/buttock discomfort that radiates inferiorly down the posterior thigh (Vij et. al., 2021).

Interestingly, a case study was reported the effectiveness of dry needling (DN) on release of myofascial trigger points in acute piriformis syndrome along with cold pack and mild stretching of piriformis muscle (Uttam, & Yadav, 2016). However, (DN) is the emerging minimally invasive maneuver indicated mainly to target and deactivate myofascial trigger points in different parts of the muscle and helps in reducing local and referred acute pain (Uttam, 2015).

classical physical therapy management contain using ultrasound therapy that followed by manual stretching the piriformis muscle in the standing or supine positions (Barton, 1991). The stretching exercises are intended to help lengthen a contracted piriformis muscle (Tina Rodrigue et. al., 2001). Neural mobilization or nerve mobilization is a technique used for treating nerves that are irritated, inflamed, or adherent. It consists of two methods: nerve gliding and nerve tensioning (Beltran-Alacreu et. al., 2015). Neural mobilization helps in relieving the nerve and restoring the normal flow of impulse through it, thereby reducing the symptoms (Kavlak & Uygur, 2011).

Traditional approaches such as lifestyle changes, medical therapy, physical therapy modalities and exercise therapy are generally successful in (PS) treatment. In patients with interventional procedures, such as dry needling (DN) may be applied to the piriformis muscle. (DN) treatment is a treatment method where myofascial trigger points (MTrPs) are stimulated using acupuncture needles or injection needles (Abbaszadeh-Amirdehi, Ansari, Naghdi, Olyaei, & Nourbakhsh, 2017). Interestingly, a case study showed that the effectiveness of dry needling (DN) on release of

myofascial trigger points in acute PS along with cold pack and mild stretching of piriformis muscle. Results demonstrated that (DN) has a positive effectiveness on PS treatment (Uttam, & Yadav, 2016). However, (DN) is the emerging minimally invasive maneuver indicated mainly to target and deactivate (MTrPs) in different parts of the muscle and helps in reducing local and referred acute pain (Uttam, 2015). In review of study that investigated the effect of dry needling on myofascial trigger points in athletes. The results of this study showed that dry needling has reduced the pain perception and increased range of motion, the quality of life, therefore, it has positive effects on pain and function (Dommerholt, 2004). The safety and effectiveness of this technique has been confirmed by several studies (Vulfsons, Ratmansky & Kalichman., 2012; Kietrys et al., 2013; Liu et al., 2015). According to our knowledge, no previous human study in Kurdistan region-Iraq has evaluated the extent of such reactions in these patients after (PS) dry needling (DN). This may be interesting investigation to use the (DN) Technique for (PS) treatment. This is first study to show a comparison between classical physiotherapy and dry needling in patient with (PS). Therefore, the purpose was comparing both therapy methods to show which was more effective in treatment of the condition.

1.2 Objectives:

1.2.1 General Objective:

This study aims to find out which therapy management method has more effect on Piriformis syndrome among general population.

1.2.2 Specific Objectives are:

1. To assess the effect of the dry needling therapy on piriformis syndrome.
2. To assess the effect of classical physiotherapy management on piriformis syndrome.
3. To compare classical physiotherapy and dry needling in patient with piriformis syndrome.

2. Methodology

2.1 Research design:

Design of the study was randomized controlled clinical trial and was conducted carried out.

2.2 Setting of the study:

The study was conducted among patients in (Rizgary hospital, European clinic, Shahd physical therapy center, Kurdistan rehabilitation center and Ali sport therapy center) in Erbil city.

2.3 The sample of the study:

The sample included 58 patients, the age range between (20-65) was taken into consideration; it has shown that in the total cases of the study were 58 cases that equally divided to two groups. In classical physical therapy group, 21 cases were male cases and 8 cases were female cases. In dry needling group, 17 cases were male cases and 12 cases were female cases. as shown in Table (2-1) and Table (2-2).

Table (2.1): Group mean values across gender

Socio-demographic				
	Classical PT		Dry Needling	
Gender	Male	Female	Male	Female
Amount	21	8	17	12
Total	29		29	

Table (2.2) group mean values according to age, weight and height.

Variable \ Group	Classical PT	Dry Needling
Age (yrs.)	34.72 ± 10.61	35.66 ± 10.75
Weight (kg)	73.21 ± 8.44	76.79 ± 13.12
Height (cm)	170.62 ± 7.58	167.38 ± 8.47

2.4 Instrument of study:

2.4.1 procedure:

Informed consent was taken from the patients or attendants. Patients of both groups received six sessions of treatment three times per week. They were monitored by supervised therapists after every session about their conditions.

2.4.2 Assessment of Pain Intensity:

The patients were requested to describe the pain intensity before each session of both treatment (Classical PT and Dry Needling). Pain intensity was assessed by means of the use of a visual analog pain scale, which is a scale ranging from zero to ten on one side. The anchors for this scale were ‘‘no pain’’ (0) and ‘‘pain as bad as it can be’’ (10). The patient subjectively estimated his/her pain level by telling the scale between zero to ten. Then, the exact value of pain intensity could be obtained by referring the scale to report it. Patients provided performance-specific pain ratings on the scale before first session, and patients were instructed to circle the numeric value that best represented their current pain level (Breivik et al., 2008).

2.4.3 Classical PT procedure:

Patients who were selected for classical physiotherapy were received in Physiotherapy Department in Rizgary hospital and other private physiotherapy clinics, The patients were requested to lie on prone position and get ultrasound therapy that acts as deep heat therapy to relax piriformis muscle. After Ultra Sound treatment the patients were asked to lie on supine position. Neural mobilization or nerve mobilization which used for treating nerves that are irritated, inflamed, or adherent. It consists of two methods: nerve gliding and nerve tensioning Then Piriformis muscle was stretched. The patients were asked to touch the knee to the opposite side of chest while his leg was rotated outward to give maximum stretch to Piriformis muscle. This position was held for 15 seconds and then the patient was instructed to relax the leg. This exercise was repeated for 10 times in one treatment session. The patient also educated to do this exercise at home which each of them performed four sets of 15 secs hold twice a day for about 2 weeks.

Figure (2.1) shows exercises techniques and ultrasound therapy.

2.4.4 Procedure of Dry Needling:

Dry needling is a skilled technique performed by Dr. Ali Astokorki who has certification in practicing Dry needling technique. The technique consists of using filiform needles to penetrate the skin and/or underlying tissues to affect change in body structures and functions for the evaluation and management of neuromusculoskeletal conditions, pain, movement impairments, and disability (Caramagno, Adrian, Mueller & Pur, 2015). The patients who put in dry needling therapy group were received the treatment in Ali sport center. The dry needling procedure employed was similar to the (MTrP) injection described by Hong (Hong, 1994; Hong, Chen, Twehous & Hong 1996). The technique involves the insertion of solid filament needles into the skin and underlying tissue to disrupt pain sensory pathways and relax contracted fibers (Dommerholt, & Fernández-de-las-Peñas, 2013). The dry needling was performed by professional physiotherapists. Patients requested to lie on prone position, The (MTrP) was located by palpating the taut band and identifying the point of maximal tenderness. This was then firmly compressed by the index finger or middle finger of the non-dominant hand to direct the placement of the needle tip while inserting the needle. A 75-mm thin filiform needle with diameter 0.35mm inserted into the skin at a point above the taut band, piriformis muscle region. After penetration of the needle into the subcutaneous layer, it was kept there and obliquely (about 45 degrees) directed to the piriformis muscle region under the fingertip of the non-dominant hand. Then, the needle was inserted rapidly into the piriformis muscle region and withdrawn rapidly. With rapid movement of needle, a Long Terminal Repeats (LTR) can always be elicited if the needle tip encounters a sensitive locus (LTR locus). The reason for employing rapid needle movements is to provide high-pressure stimulation for eliciting (LTRs) and to avoid side movement of the needle that may side cut (stretch) the muscle fibers. The needle insertions were repeated to elicit as many (LTRs) as possible. Usually, 3–10 mins were required for the complete procedure in each site of the muscle region. As soon as

the needle was pulled out of skin, the piriformis muscle region and the open surface point of the needle insertion site were sterilized by alcohol to prevent contamination (Hsieh, Kao, Kuan, Chen, Chen & Hong, 2007).

Figure (2.2) shows Dry needling technique.

2.5 Methods of data collection:

A structured and self-administered questionnaire including sections for demographic characteristics, knowledge, rate, sessions and effects of both methods of management for piriformis syndrome was used for data collection.

2.6 Ethical consideration:

Official approval and consents were obtained from the College of Health Sciences/ Hawler Medical University to conduct the study.

2.7 Inclusion and exclusion criteria:

1. Inclusion criteria, young aged patients showcasing symptoms of piriformis syndrome
2. Exclusion criteria; old aged patients because of many related disorders like osteoporosis, lumbar disc herniation and other diseases.

2.8 Statistical analysis:

All data are reported as means ± SD. Prior to statistical analysis,

assumptions were checked for each statistical test. Mean ratings of pain effect for groups (classical PT and dry needling) were analyzed using a repeated measures analysis of variance (ANOVA), with the factor of groups on all sessions (6 sessions). Paired-sample T. Test was analyzed to see the different for each group from 1 session compare to 6 sessions (effectiveness for both treatment). Mean ratings of pain for both groups on all means of sessions (from 1 session to 6 session) were analyzed using an independent sample T. Test. compare means to determine whether the population means are significantly different. Statistical analysis was performed using the statistical pack-age SPSS version 26 for Windows programs (SPSS Inc., Chicago, IL, USA). Descriptive data are reported as means ± SD. Statistical significance was accepted when $p < 0.05$.

3. Results

Paired-Sample T.Test indicated significantly difference mean ratings of pain affect from session 1 compare to session 6 for classical physical therapy $T(28) = 14.065$, $p = 0.000$, As shown in Figure (3-1).

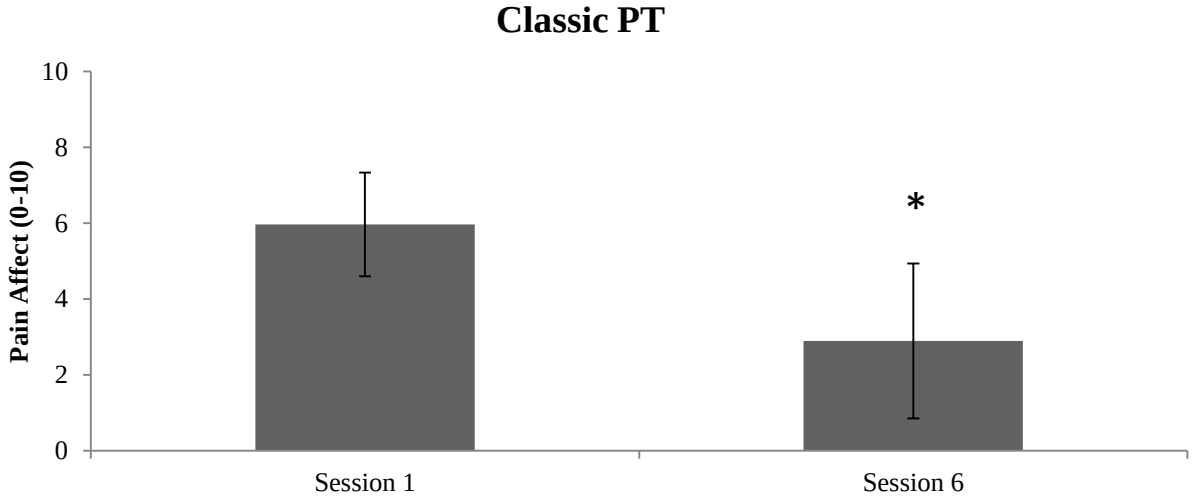

Figure (3.1): classical physical therapy session chart.

Paired-Sample T.Test also showed significantly difference mean ratings of pain affect from session 1 compare to session 6 for dry needling therapy $T(28) = 11.119$, $p = 0.000$, As shown in Figure (3-2).

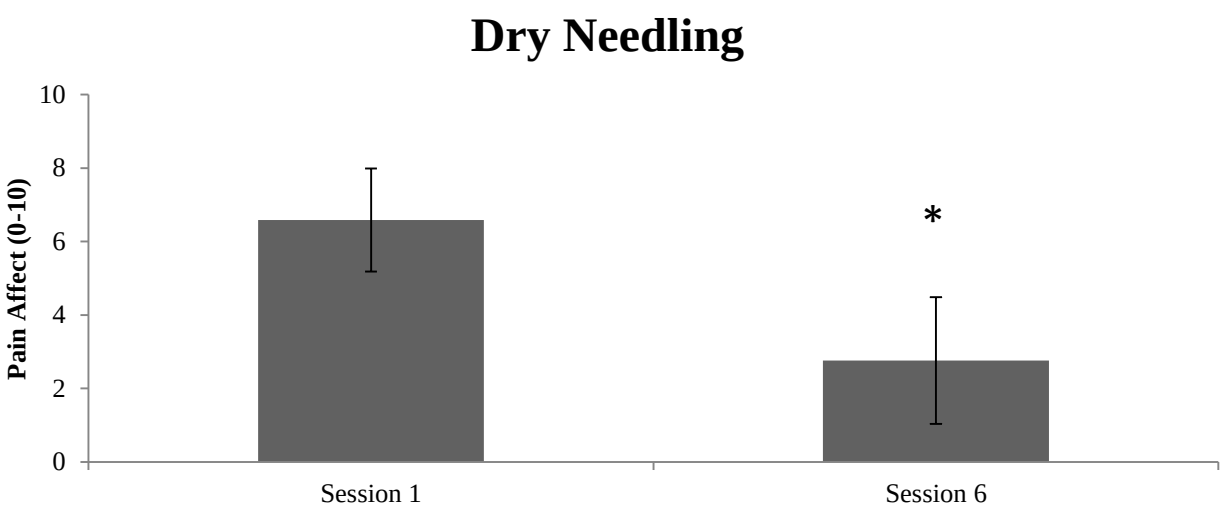

Figure (3.2): dry needling therapy session chart.

Independent sample T.Test. showed no significant difference in all means between classical physical therapy and dry needling. T (56) = − 0.783, p = 0.437, As shown in Figure (3−3).

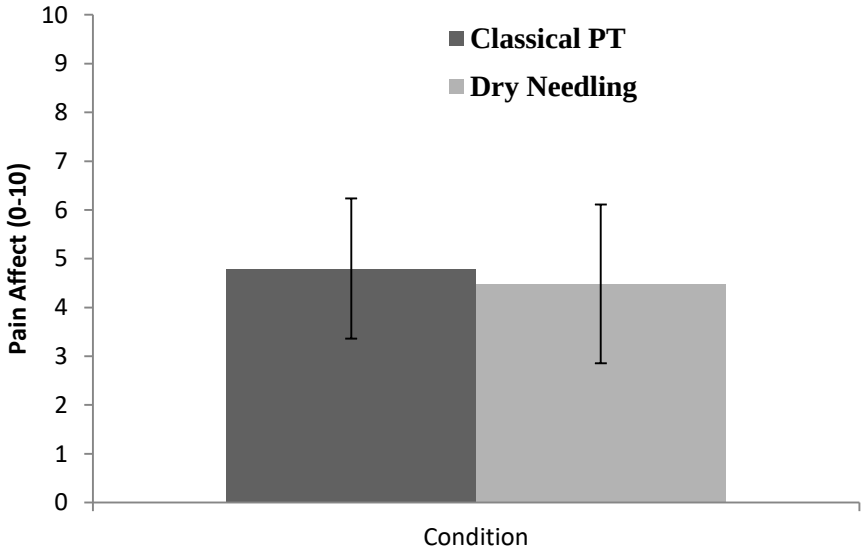

Figure (3.3): comparing methods chart.

Mean ratings of pain affect did not differ across the two groups classical physical therapy and dry needling for all sessions on condition, $F_{(5,\ 2.66)} = 1.522$, $p = 0.183$ (Figure (3-4)). The study focuses on how much pain decreased in six sessions for each group, and then, comparing both groups to see which of them is more effective for treating the piriformis syndrome, those table show the effective of each group of treatment separately and then.

There was also no significant difference between groups for each session of mean ratings of pain effect session 1 ($T_{(56)} = -1.706$, $p = 0.094$), session 2 ($T_{(56)} = -1.110$, $p = 0.272$), session 3 ($T_{(56)} = -0.866$, $p = 0.391$), session 4 ($T_{(56)} = -0.720$, $p = 0.474$), session 5 ($T_{(56)} = -0.524$, $p = 0.0.602$), session 6 ($T_{(56)} = 0.278$, $p = 0.782$), as shown in Figure (3-5).

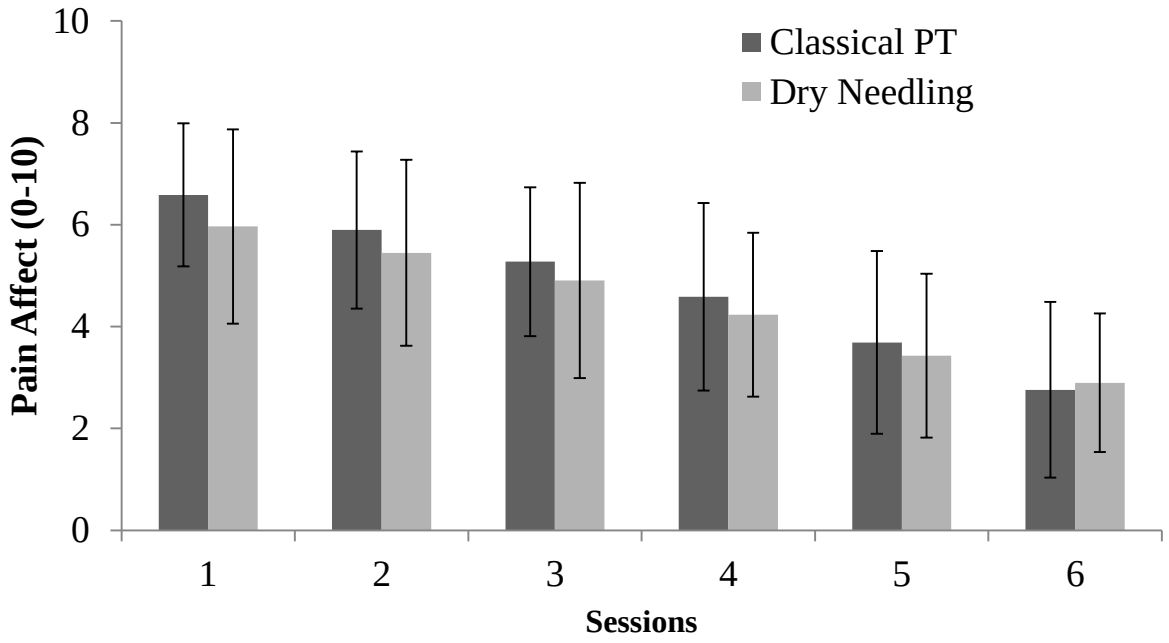

Figure (3.4): effectiveness of both methods across sessions chart.

Table (2.3) group mean values according to pain scale for (session 1 vs. session 6).

Variable \ Group	Classical PT		Dry Needling	
Mean Pain	4.799 ± 1.437		4.483± 1.627	
Mean Pain Session (1 vs. 6)	Session 1	Session 6	Session 1	Session 6
	6.586 ± 1.402	2.759±1.725	5.9656±1.369	2.897±2.041

Table (2.4) group mean values according to pain scale across 6 sessions.

Variable \ Group	Sessions					
	1	2	3	4	5	6
Classical PT	6.586±1.402	5.897±1.543	5.276±1.461	4.586±1.842	3.690±1.795	2.759±1.725
Dry Needling	5.966±1.369	5.448±1.531	4.907±1.721	4.232±1.868	3.431±1.958	2.897±2.041

4. Discussion

The purpose of this study was to investigate the effect of each classical (PT) and dry needling therapy on piriformis syndrome and compare to each other to show which group is more effective. The primary finding was that both interventions groups by using classical physical therapy and dry needling lead to reduce pain effect of (PS). According to this study results, Paired-Sample T.Test indicated significantly difference mean ratings of pain affect from the first session to last session for classical physical therapy $T(28) = 14.065$, $p = 0.000$. There was significant improvement in pain from 6.58 to 2.75 after six sessions of classical physiotherapy by using ultrasound, stretching piriformis and mobilization

of sciatic nerve. In other group using by dry needling, Paired-Sample T.Test also showed significantly difference mean ratings of pain affect from the first session compare to the last session $T(28) = 11.119$, $p = 0.000$. The mean pain improved from 5.96 to 2.89 after six sessions of dry needling therapy. In this study is realized that the majority of cases those who presented with piriformis syndrome, both types of interventions have significant effect in managing pain and improving the condition. On the other hand, there is no difference in average of decreasing the pain to decide which type of management are more effective when independent sample T.Test showed no significant difference in all means between classical physical therapy and dry needling. $T(56) = -0.783$, $p = 0.437$ which it means that both types of treatment are equally effective. This is because both interventions have improvement at the same time of pain reduction. According to our knowledge, up to the time of preparing this study research, no similar trial of comparing these two methods was carried out specifically to piriformis syndrome, or at least, it did not have access to it.

There are limited studies that compare dry needling to classical physiotherapy in treatment of myofascial trigger point. However, there is not trials in evaluating the effect of either physiotherapy or dry needling in piriformis syndrome. Rodger and Hallin (1983) mention that most of the time in sports medicine regular stretching and manual therapy, like soft tissue mobilization approaches, leads a greater decrease and elimination of piriformis syndrome (Rodger & Hallin, 1983). The result of the study performed by Fishman (2002) demonstrations that deep friction massage is also helpful for release of piriformis muscle with passive internal rotation of hip (fishman et. al. 2002). The study of Boyajian and his friends (2008) indicate that cold and heat application on the irritated and tight piriformis muscle before and after physical therapy helps in lessening the discomfort felt after therapy (Boyajian et. al., 2008). In the study by Gam et al., (1998) ultrasound alone has not been effective, nonetheless adding exercises and neural mobilization has caused significant pain reduction (Gam et

al, 1998). The study that was done by Uttam et al. (2018) shows that the dry needling has been considered effective in immediate recovery of pain and improvement of range of motion (ROM) by releasing the trigger points in acute PS (Uttam, 2016). The study achieved by Shah et al. (2008) finds that dry needling significantly decreases the concentration of P substance and calcitonin associated with peptide 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 (Shah et al, 2008). Dry needling results in activate of Enkephalinergic interneurons in the dorsal horn of spinal cord and it thus reduces the pain (Tough et. al. 2009). Nevertheless, dry needling has been capable of decreasing the muscle stiffness and activating inhibitor control system (Edwards & Knowles, 2003). Therefore, the results of dry needling implication on piriformis muscle were pain reduction that was agreement with the results of this study (Jamaly, Mohsenifar & Amiri, 2018). Moreover, Rayegani et al. (2014) gained significant improvement in pain and some scale of quality of life in both groups (classical physiotherapy and dry needling therapy) treatment when they used to treat myofascial trigger point. they mention that no significant difference was observed between the results of both groups (Rayegani et al., 2014). All of those studies are supporting our study that both of treatment ways are effective.

5. Conclusion

The purpose of this study was assessing and comparing both types of mentioned managements on piriformis syndrome. Results of this study review has shown that both classical physical therapy and dry needling therapy have significant effect in treating and managing the pain in patients with piriformis syndrome and there is no significant difference was observed between the results of both therapy groups.

6. Recommendations

After this study concluded, revised and taken the results into consideration, it's recommended that:

1. The diagnosis should be done by specialist.
2. Patients shouldn't have any related diseases to be not confused.
3. The pain scale should be understandable and clear to patients to be more accurate.
4. The occupation of patient should be mentioned, because it can affect the condition.

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Table of content

Appendix……
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Appendix:

Effectiveness Of Dry Needling Compare to a Classical Physiotherapy Program in a Patient with Piriformis Syndrome.

Part 1: Demographic Data/

- Name/
- Age/
- Phone number/
- Gender/ Male ☐ ☐ Female
- Weight/
- Height/
- Occupation/
- Degree of education/

Part 2: illness information/

- Chief complaint /_____
- Aggravating factors/_____
- Resting factors/_____ ____
- Type of pain/ Sharp ☐ Crushing ☐ Burning ☐ Aching ☐ Dull ☐ Cramping ☐ Pinching ☐ Shooting ☐ Itchy ☐ Sore

- Pain Duration / Constant Intermittent
- Does it radiate down to legs/ Ye NO
- Intensity of pain/ 1 2 3 4 5 6 7 8 9 10

- Diagnosis/_____

_____

Part 3: Treatment/

- Type of treatment / Dry Needli Electrotherapy Exercise
- Intensity of pain after sessions/

■ Session 1/ 1 2 3 4 5 6 7 8 9 10

■ Session 1/ 1 2 3 4 5 6 7 8 9 10

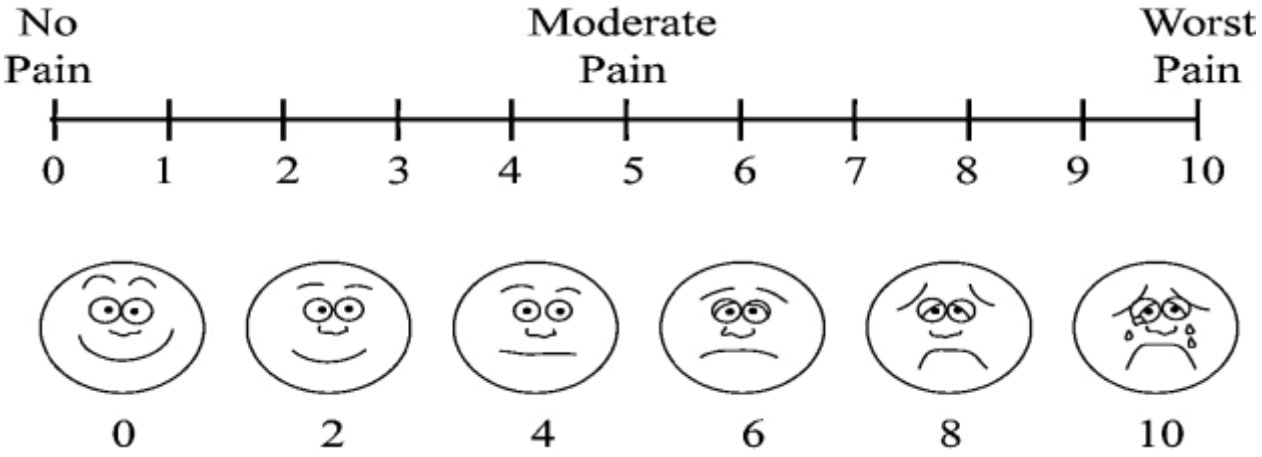
■ Session 1/ 1 2 3 4 5 6 7 8 9 10

■ Session 1/ 1 2 3 4 5 6 7 8 9 10

■ Session 1/ 1 2 3 4 5 6 7 8 9 10

■ Session 1/ 1 2 3 4 5 6 7 8 9 10

Visual analogue pain scale:



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