



The immediate effect of Self-Myofascial Release using tennis ball on pain in individuals with piriformis trigger points

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Received: 10 April Revised: 18 April Accepted: 26 April

Abstract

Skeletal muscle is the largest organ of the body, making up nearly 50% of the body weight. Muscles are considered motors of the body. They work with and against the gravity. Due to hectic lifestyle and perpetuating factors like sprains, poor postures, sleep deprivation, overloading or overuse of muscles, fatigue can increase the irritability of muscles, leading to the propagation of Trigger points and increasing the distribution and severity of pain. Work requiring twisting while lifting can stress the piriformis, inactivity as well as prolonged sitting can cause pain leading to trigger points. These trigger points in piriformis muscle may lead to difficulties in day to day life and therefore should be treated first, and SMFR is the best way to do it. The study performed was an experimental study involving 43 subjects from Dr. D.Y. Patil Physiotherapy OPD, Pimpri, Pune. Piriformis trigger points were palpated, pain was assessed before and after the treatment by NPRS and pain threshold by Pain Pressure Algometer, subjects were asked to take small circular movements by sitting on a tennis ball under the buttocks for 60 seconds. The study concluded that Self-Myofascial Release using tennis ball helps in reducing pain and increasing the pain pressure threshold providing a simple yet effective alternative for piriformis trigger points pain.

Keywords: NPRS, Pain Pressure Algometer, piriformis, SMFR, tennis ball, Trigger points.

Introduction

A Myofascial trigger point is defined as “a hyperirritable spot, usually within a taut band of skeletal muscle or in the muscle’s fascia, that is painful on compression and that can give rise to characteristic referred pain, tenderness, and automatic phenomena.”¹ The trigger points in skeletal muscles provides referred pain patterns that are consistent of specific site of origin, whereas the trigger points in other tissues such as skin, fat pads, ligaments do not hence they are not considered myofascial.

Trigger points are classified as being active or latent, depending on their clinical characteristics. An **active trigger point** causes pain at rest. It is tender to palpation with a referred pain pattern that is similar to the patient’s pain complaint. This referred pain is felt not at the site of the trigger-point origin, but remote from it. A **latent trigger point** does not cause spontaneous pain, but may restrict movement or cause muscle weakness.²



Myofascial trigger point is identified by the diagnostic criteria led by Simon, these are:

1. Palpable taut band presence in a skeletal muscle.
2. Presence of a hypersensitive tender spot in the taut band.
3. With snapping palpation of the taut band a Local twitch response is provoked.
4. With compression there is reproduction of the typical referred pain pattern of the MTrP.
5. Spontaneous presence of the typical pain pattern and/or patient recognition of the referred pain as familiar.³

Precipitating factors like contusions, sprain and strains, chronic repetitive overloading or overuse of muscles, poor postures, reduction in myofascial flexibility, anxiety, sleep deprivation leading to increased muscle tension, fatigue, vitamin insufficiency may give rise to Myofascial pain and trigger points. These factors may cause the facilitated release of acetylcholine at motor end plates, sustained muscle fibre contractions and local ischemia with release of vascular and neuroactive substances, and muscle pain. More acetylcholine may then be released, thus perpetuating the muscle pain and spasm.⁴ Studies have showed there is great prevalence of myofascial dysfunction in patients with low back ache and this deserves specific attention.⁵ The main muscles afflicted by trigger points that can be related are: piriformis, quadratus lumborum, iliopsoas, gluteus maximus, gluteus medius, gluteus minimus.⁵

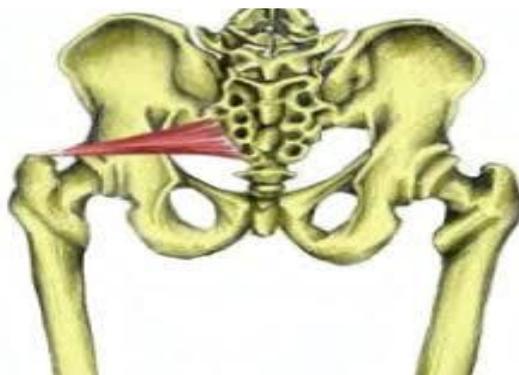
Piriformis is a flat, pyramid shaped muscle that lies parallel to the posterior border of the gluteus medius.

Origin: It arises from the pelvic surface of the middle three pieces of the sacrum, upper margin of the greater sciatic notch.

Insertion: The rounded tendon is inserted into the apex of the greater trochanter of the femur.

Action: Lateral rotation of thigh at hip joint, Abduction above 90° of hip flexion.

Nerve supply: Ventral rami of S1, S2.⁶



Trigger pain in piriformis muscle are common. It may be due to reading in bed with your knees bent, sitting on the floor especially with your knees bent up in front of you, muscle overload due to sudden movements or picking up and lifting objects, prolonged periods of driving or sitting, forceful rotation of your body while your weight is on one leg.



Referred pain of Piriformis muscle: Pain is referred primarily to sacroiliac region, over the hip joint posteriorly, also extends over the proximal two-third of the posterior thigh.²



For the deactivation of trigger points Myofascial Release is given. The traditional technique used for the deactivation of trigger point is the ischaemic compression technique where the therapist compresses the trigger point with tolerable pain intensity using thumb pressure, as the pain felt by the patient decreases the intensity of the compression increases. The other technique that is used is SMFR i.e. Self MyoFascial Release technique. The difference between the SMFR and the traditional technique is that the SMFR is performed by the individuals themselves rather than by the therapist. There are tools that assist the individual in performing the SMFR; these tools are foam roller, lacrosse ball, tennis ball, roller massager, etc. The advantage of SMFR over ischaemic compression is that the patient gets immediate feedback of overdoing when he/she does it which minimizes the risk of prolonged or excessive pressure. The best MFR tool for a number of muscles may simply be a ball, a tennis ball can be used for this, putting a tennis ball in a sock will help in losing control over its placements.⁸

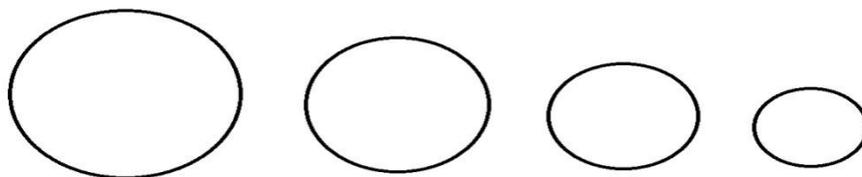


Fig:- Balls for mfr: (a) tennis ball (60-64mm); (b) tennis ball (45 mm); (c) tennis ball (35 mm); and (d) tennis ball (24mm).

There are various size of tennis balls that are used for MFR for various places:-

The tennis ball ranging from 60-64mm sizes these are meant to be used on the arms, shoulders, chest, hips, legs, back, and buttocks against the wall. The tennis ball of 45 mm is useful to sit on to MFR the buttock and pelvic floor muscles or to massage small forearms against a wall. The 35mm



tennis ball is useful for bottom of the feet against the floor or beside the spine against a wall. The 24 mm ball is for the hand and base of the thumb against a wall.⁸

For Piriformis muscle tennis ball can be used as a SMFR tool of size 60-64 mm for using it against the wall or a 45 mm to sit on to as they are small and lightweight and have the right amount of firmness to dip deep into the fascia with less soreness the ball is placed on piriformis, the individuals rolls in small circular movements on the ball over the trigger points and applies the body pressure on the ball, the individual holds the position for 60 seconds.

Need of study

The Piriformis Muscle is the deep muscle in the gluteal region. It helps in sitting with knee bent, prolonged sitting etc. Work that requires twisting while lifting can stress the piriformis, inactivity in old age as well as prolonged sitting will cause pain and lead to trigger points. These trigger points in piriformis muscle may lead to difficulties in day to day activities therefore emphasis should be given for treatment of these trigger points. There are studies which show the effectiveness of traditional ischaemic compression technique on piriformis muscle. These studies however showed the effect only in ischaemic compression technique hence the need arises to see the effect of Self-Myofascial Release with tennis ball on the trigger points of piriformis muscle.

Aim and objectives

Aim: To see the immediate effect of Self-MyoFascial Release using tennis ball on pain in individuals with piriformis trigger points.

Objectives:

1. To assess the effect of trigger point release with tennis ball on pain by using NPRS.
2. To assess the pain threshold with Pain Pressure Algometer.

Review of literature

1. **Daniel Martins Coelho, Rafael Inacio Barboda**, et al conducted a study on "Prevalence of Myofascial dysfunction in patients with low back pain" in 2014 which concluded that there is great prevalence of myofascial dysfunction in patients with low back pain and these prevalence needs specific attention when treating for low back ache.⁵
2. **Gazbare P, Palekar T, Rathi M** conducted a study on "COMPARISON OF ULTRASOUND AND ISCHAEMIC COMPRESSION ON LATENT TRIGGER POINT IN UPPER TRAPEZIUS" in 2014 which concluded that ischaemic compression therapy should be the preferred therapy for treatment of latent trigger points.³
3. **Kisner Ann M, Sands Willam A, Stone Michael H** conducted a study on "RELIABILITY AND VALIDITY OF A PRESSURE ALGOMETER" in 2009 which concluded that in practice the investigator may have high reliability in the rate of force application.⁷



4. **Eng-Ching Yap** conducted a study on “Myofascial Pain-An Overview” in 2007 which concluded that it is a major source of muscular dysfunction and its early diagnosis and treatment may help to reduce overlying psychological burden of the patient.⁴
5. **David G. Simons** conducted a study on “Myofascial Pain Syndrome due to Trigger Points” which concluded that patients should avoid perpetuating factors that help to convert latent trigger point in active trigger points

Materials and methodology

An experimental study with convenient sampling was conducted on 43 individuals with piriformis trigger points, of age group 20-40 years, both genders, who are not taking any treatment for piriformis trigger points with posterior hip pain with or without extending over the proximal two third of post thigh and piriformis trigger points. A written consent was taken prior giving any treatment, patients with any neurological, rheumatic disease presence of knee or ankle instability, fractures of upper or lower limb or associated low back ache were excluded from the study. They were assessed by palpating piriformis trigger points, pain and pain threshold was assessed by NPRS and Pain Pressure Algometer, pre and post treatment. Individuals were asked to sit on the tennis ball and take small circular movements for duration of 60 seconds.

Procedure

Ethical clearance was obtained from Institutional ethical committee of Dr. D. Y. Patil College of Physiotherapy. 43 individuals of age 20-40 years were selected in the study. The subjects selected were those who met the inclusive criteria and exclusion criteria and who were willing to undergo this study. All the subjects were informed about the purpose of the study and a written consent along with demographic information was obtained from each of them.

Subjects presenting with piriformis tightness, pain in sitting, posterior hip joint, proximal two-third of the posterior thigh region were included. The subjects were assessed before the treatment. Pain was assessed by NPRS prior the treatment. Trigger point was palpated and marked with a marker. Pain Threshold was measured by pain pressure Algometer. The subjects were given treatment for 60 seconds and post treatment readings were taken. The assessment procedure included the following:-

1. Pain Assessment:

- a. **Pain Pressure Algometer:** Reliability of the instrument is 0.9-0.95.⁷ Pressure algometer helps in measuring the deep pressure pain threshold or tenderness by applying pressure with a rubber disk having an area of 1cm², the device displays the pressure. The Pressure Algometer was placed against the site to be tested and was pressed against the tester in a vertical direction while increasing the force at a constant rate of 1kg/cm². The subject was instructed to express pain either by saying “ouch” or raising their hand when slight pain is felt. The application of the pressure with the algometer was interrupted the moment the subject reported feeling pain. The pressure pain threshold was judged to be abnormal if below 2.3 kg/cm².⁵ Three readings were taken with 10 second interval and the mean was calculated.



Palpation of Piriformis Trigger Points.

For Treatment of Piriformis Trigger Point:

A Tennex tennis ball of 45mm was used for the treatment. Subject were asked to place the ball below the buttocks, the patients sat on the ball so it's positioned underneath the piriformis, the patient were asked to keep the unaffected leg bent and the affected leg should be bent in such a way that your ankle crosses over your unaffected thigh. Instruct the patient to take small circular movements round the area for 60 seconds, the patient were asked to apply body weight. After 60 seconds post readings were taken.



SMFR given by tennis ball.

Post treatment some patients complaint of soreness, ice pack was applied to these subjects. Self stretching for piriformis was taught to eveyone.

Data analysis and interpretation.

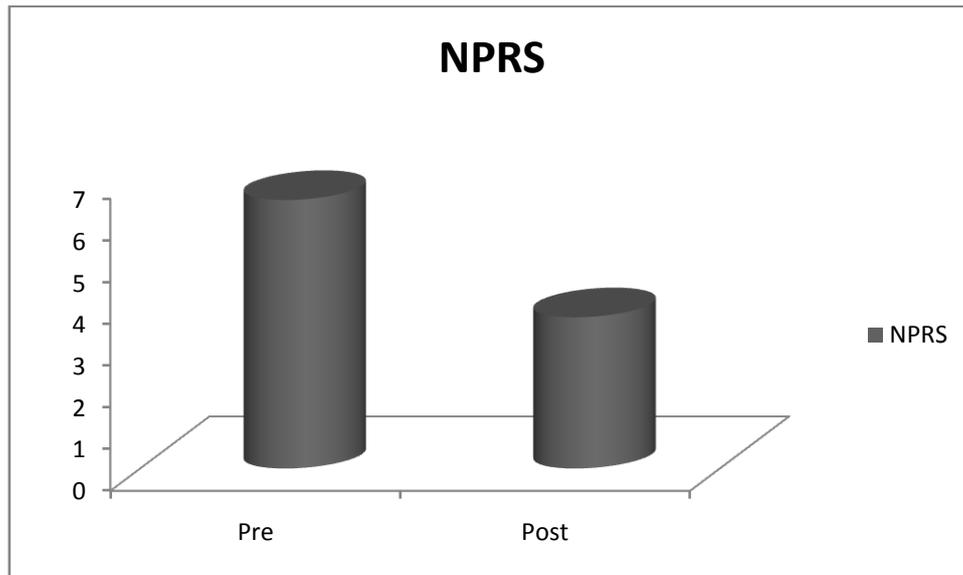
Graph I : Shows the PRE and POST Treatment NPRS Comparisons.

t test $t=10.71$ $p=0.00$



Table i: Mean of NPRS.

NPRS	
PRE Treatment	6.44
Post Treatment	3.62



Interpretation : Graph I shows Pre Post Treatment Mean values ie. Post treatment the NPRS scores are less it is due to the reduction in pain.

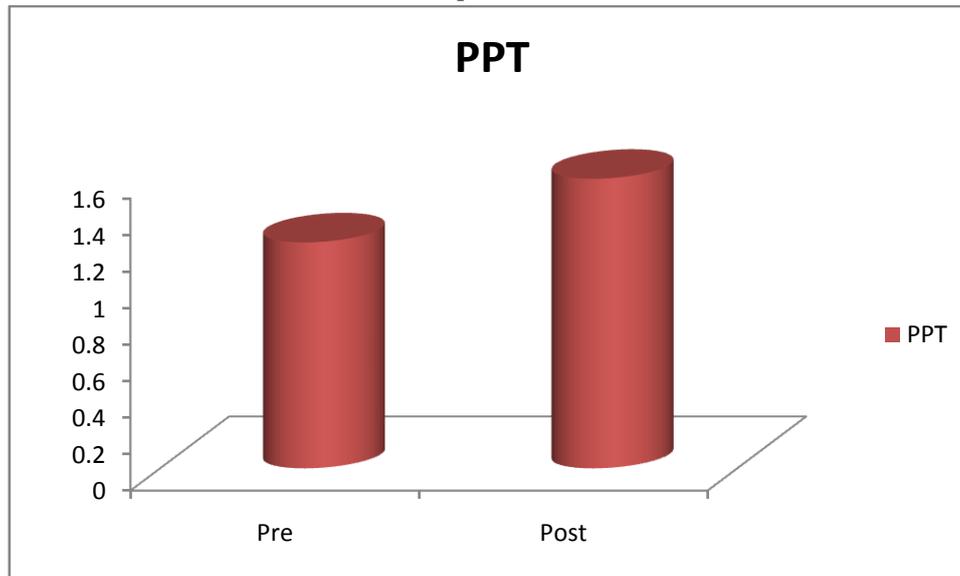
Graph II: Shows the Pre Post Pain Pressure Threshold.

t test

t= - 6.5 p=0.00

Table II: Mean of PPT

PPT	
Pre Treatment	1.23
Post Treatment	1.58



Interpretation: Graph II shows the Pre Post Pain Pressure Threshold values ie. The post treatment shows increase in the pain pressure threshold of the patient.

Result:

Results show that there is reduction in pain and increase in the pain pressure threshold after the treatment.

Discussion:

The goal of the study was to see the effect of self-myofascial release with tennis ball in patients with piriformis trigger points. There are many studies showing the effect of Myofascial release by traditional ischaemic compression method which has proven to be effective but the main question remains, does the Myofascial release is obtaining just by ischaemic compression technique or can be done only by a therapist at hand? In recent years Self-Myofascial release has proven to be a quick go to treatment by many athletes and normal individuals. The easiest known among all this is a ball.

The lacrosse ball has turned out out to be one of the easiest and the best SMFR tool, but the cost of this tool is high and not readily available due to which it is not bought by the patient, Tennis ball on the other hand is readily available at any local shops and quite affordable, but it is not known whether it helped in releasing the piriformis muscle.

The present study tried to determine the effect of tennis ball as SMFR tool on piriformis muscle, to see the effect of this tennis ball on pain, and to check the pain pressure threshold after using tennis ball. An Experimental study was conducted with the patients presently complaining of pain in gluteal region with or without radiating to proximal two third of thigh, piriformis tightness etc. It was a convenient sampling. The sample size was 43 which was taken with result of OpenEpi Version 3 open source calculator---SSProper with 9% error.



The study showed the pre and post treatment comparison on pain through NPRS and pain pressure threshold through Pain Pressure Algometer readings.

It was seen that after the treatment the pain was significantly less in the samples this was checked by NPRS. The Pain Pressure Threshold which was taken by the Pain Pressure Algometer showed increase in the post treatment records.

Myofascial trigger points are associated in areas of muscle that have tender nodules under palpation, this stiffness might arise from hyper contracture of the sarcomere in this area. Overuse of muscle which may be due to certain activities may lead to this hypercontracture⁴. During a movement sarcomere in the muscle being overused leading to increased muscle fibre tension, leading to taut band which is thought to constrict blood flow and reduction in oxygen disrupting mitochondrial energy metabolism reducing ATP leading to tissue distress and release of toxins which activates nociceptors (pain receptors) and leads to pain¹². Applying prolonged or amplified pressure to the muscle belly will lead to the relaxation of muscle. It is thought to reduce ischemia by increasing blood circulation to the skin and muscles, reducing parasympathetic activity and releasing the relaxation hormones and endorphins reducing neuromuscular excitability of muscle and minimize MTrPs activity and pain, muscle spasm¹³.

A similar study was performed on pragmatic clinical investigation of the comparative effectiveness of ischaemic compression and cryo-ischaemic compression in the treatment of rhomboid Myofascial pain syndrome by Sholini Sookraj⁹ which proved that cryo-ischaemic compression using the cold tennis ball technique provides a simple effective treatment for Myofascial Pain our study too showed the effect of tennis ball on reduction of pain. This means that when deep pressure is applied, where there is compression of taut bands to the extent the patient could tolerate was effective in treating myofascial trigger points.

A study was done on the immediate effects of self-myofascial release on latent trigger point sensitivity: a randomized, placebo-controlled trial by Jan Wilke¹⁰ which concluded that self-myofascial release might represent an alternative to reduce pressure pain of latent MTrP. Our study too show that with self- myofascial release the pain did reduce helping in reduction in trigger points.

Another study was performed on the pain pressure threshold of a muscle tender spot increases following local and non- local rolling massage by SJ Aboodarda¹¹ which concluded that rolling on muscles containing a hypersensitive tender spot can provide an increase in pain threshold and it reduces pain perception due to analgesic effect our study too shows that there is increase in pain pressure threshold after the treatment.

Skeletal muscle is the largest organ of the body, making up nearly 50% of the body weight. Muscles are considered motors of the body. They work with and against the gravity¹. Due to hectic lifestyle and perpetuating factors like sprains, poor postures, sleep deprivation, overloading or overuse of muscles, fatigue can increase the irritability of muscles, leading to the propagation of Trigger points and increasing the distribution and severity of pain. Work requiring twisting while lifting can stress the piriformis, inactivity as well as prolonged sitting can cause pain leading to trigger points. These trigger points in piriformis muscle may lead to difficulties in day to day life and therefore should be treated first, and SMFR is the best way to do it.



While undergoing the study we found out some of the leading cause for the piriformis trigger points in patients were distress, inactivity, poor postures, overuse of muscles. The key benefit of the treatment consists in the fact that the treatment can be performed by the individual himself and according to his/her needs. In our study it was seen that there was significant reduction in pain with the use of tennis ball. This can help the individuals in day to day life with helping them in reducing the pain, as it is quicker easier and affordable to everyone.

Conclusion

The study proves that Self-Myofascial Release using tennis ball can help in increasing the pain pressure threshold and reducing the pain and hence can provide a simple, effective alternative for piriformis referred pain.

Limitations

- The sample size was small
- Patients complained of soreness after the treatment

Future scope

- Same project with larger sample size
- Performing treatment for a period of week or two every alternate day for clear indication of result.
- Performing with tennis ball on different muscles.
- To compare lacrosse ball vs tennis ball SMFR for treatment of piriformis trigger points.

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International journal of basic and applied research

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ISSN 2249-3352 (P) 2278-0505 (E)

Cosmos Impact Factor-**5.960**

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