Stretching and self-myofascial release in piriformis syndrome

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Abstract

Piriformis Syndrome (PFS) is defined as a cluster of pain symptoms located in the lumbar and gluteal areas, radiating towards lower limbs. PFS is often misdiagnosed as sciatica, and can lead to chronic pain, scarring of the sciatic nerve or, and in extreme cases, to sciatic nerve paralysis. Among the causes of PFS we can distinguish reflex reactions to overload often resulting from incorrect body posture, sedentary lifestyle, or incorrect muscle training techniques. The aim of this paper was to highlight the diagnostic methods and examples of stretching exercises along with self-myofascial release, which can be used to effectively treat piriformis syndrome.

Key words

piriformis syndrome, self-myofascial release, diagnostic testing, stretching exercises.

Introduction

Piriformis syndrome (PFS) was first defined by Robinson in 1947 as a cluster of pain symptoms located in the lumbar and/or gluteal areas, radiating towards the lower limbs. Epidemiological studies suggest that PFS accounts for approximately 6-8% of sciatica cases. PFS often leads to chronic pain, scarring of the sciatic nerve or, in some cases, can even lead to sciatic nerve paralysis. The pathomechanism of this syndrome informs that the occurrence of increased tension in the piriformis muscle after a prolonged period of time can lead to compression of the sciatic nerve, which then results in permanent and constant localised pain [1].

Anatomy of the piriformis muscle

The piriformis muscle (Latin: *Musculus piriformis*) is a small muscle located on the pelvic surface of the sacrum reaching the apex of the greater ileum of the femur [2].

The main function of the piriformis muscle is rotation of the hip joint. The piriformis muscle is responsible for external rotation during hip flexion from 0 to 70 degrees, and internal rotation when hip flexion exceeds 70 degrees. The piriformis muscle is also involved in straightening as well as abduction of the hip joint. It serves as one of the stabilizers of the hip joint, working together with the external obturator (Latin: *musculus obturator externus*), and internal obturator muscle (Latin: *musculus obturator internus*), as well as the gemelli muscles (Latin: *musculi gemelli superior et inferior*). It is involved in stabilizing the pelvis and controlling the position of the femoral head in the acetabulum during gait [3].

Aetiology of piriformis syndrome

Primary – anatomical predispositions account for approximately 15-20% of the disorder. The sciatic nerve may pass in a specific way just under the muscle or pass through the belly of the piriformis muscle thereby dividing the muscle into two parts which increases the risk of damage to the muscle fibers as a result of trauma, shortening, or damage to the structures surrounding the muscle. *Secondary* – reflex responses to overload often resulting from poor posture, a sedentary lifestyle or incorrect muscle training techniques. Muscle structures (mainly hip flexors) are shortened, resulting in a muscle imbalance that leads to overload, reduced joint mobility, incorrect muscle length and flexibility, and incorrect movement patterns [4].

PFS can also be associated with low gluteal muscle activity leading to increased muscle tone of the iliopsoas (Latin: *musculus iliopsoas*), hamstring (Latin: *musculus semimembranosus*, Latin: *musculus semitendinosus*, Latin: *musculus biceps femoris*), rectus femoris (Latin: *musculus rectus femoris*), adductor longus (Latin: *musculus adductor longus*), and piriformis (Latin: *musculus piriformis*). Frequent physical activity of the lower limbs in a sitting position (e.g., cycling) may increase the risk of piriformis muscle strain. Overdevelopment of the piriformis muscle (by minimum 40%) results in excessive pressure on the sciatic nerve [4].

Symptoms of piriformis syndrome

PFS causes pain located in the lumbar and gluteal areas. A symptom characteristic to PFS is also pain radiating down the lower limb. PFS often causes significant reduction of internal hip rotation, which then leads to the hip joint remaining in external rotation while in resting position. Functional asymmetry of the lower limbs is often observed with the piriformis syndrome, which is then frequently misdiagnosed as sacroiliac joint block. Symptoms attributed to the piriformis syndrome decrease mobility, especially when climbing stairs. One's ability to bend forward with straight legs is also significantly limited [5]. Increased irritability of the gluteal area and greater trochanter of the femur, as well as the presence of trigger points, may be detected during palpation. PFS can also lead to pressure on the pudendal nerve resulting in tingling, numbness in the perineal and groin area, and a risk of urinary and fecal incontinence [6].

Diagnostic tests

In diagnosing piriformis muscle syndrome, sciatica should be ruled out. For this reason, magnetic resonance imaging is mainly used to exclude neurological or orthopedic causes of this condition. Functional tests such as the Pace test, Freiberg test, FAIR test, and Batty test are used to diagnose PFS.

Pace test

Patient in a sitting position. Resisting abduction of the hip joint causes pain in the gluteal area (**Figure 1**).

Freiberg test

Patient in supine position. The patient's lower limb is passively positioned in internal rotation, knee joint straight. In piriformis syndrome, this position causes pressure to the sciatic nerve which induces pain (**Figure 2**).

Figure 1. Pace test.

Figure 2. Freiberg test.

FAIR test (flexion, adduction, internal rotation)

Patient in a supine position. The patient's lower limb is passively positioned by the physiotherapist in flexion, adduction, and internal rotation at the hip joint. The test is considered positive when there is pain in the gluteal area (**Figure 3**).

Batty test

The patient in the lateral recumbent position (on the non-painful side). The physiotherapist positions the patient's lower limb in flexion (up to 60 degrees) at the hip joint and slight flexion (about 10 degrees) at the knee joint. The test involves the patient performing an active movement (or against resistance) of lower limb abduction. The test is positive when the patient feels pain in the gluteal area (but does not appear in the lumbar region of the spine) (**Figure 4**).

Figure 3. FAIR test.

Figure 4. Batty test.

To rule out sacroiliac joint blockage, shortening of the hamstring muscle group, or sciatic nerve irritation, further functional tests such as the sacroiliac joint compression test, the finger-to-floor test, or the Lasegue sign can be used to eliminate nerve root irritation [7].

A crucial element of treatment is the prevention of further occurrence of this condition which includes: learning correct posture, systematic stretching and strengthening exercises of the hip girdle and lower limbs, patient education on ergonomics both at work and in everyday life, patient awareness of the consequences of untreated PFM syndrome [8].

Physiotherapy for piriformis syndrome

Appropriate physiotherapy treatment should focus on eradicating dysfunction by reducing pressure on the piriformis muscle. Stretching exercises for the piriformis muscle combined with self-myofascial release are effective in treating this syndrome. Treatment should also focus on strengthening the gluteal muscles, particularly the gluteus minimus muscle [9].

Self-myofascial release

Self-myofascial release is a form of self-massage that can be performed with a roller, also known as a foam roller (for larger surface areas) or massage balls (for more localised massage). Pressure from the roller leads to local stimulation of the tissue, which sends out an impulse to stimulate or inhibit fascial proprioceptors in the tissue spaces. This improves hydration of the tissue, which in turn increases its elasticity. The effects of self-myofascial release are comparable to those of sport massage. Self-myofascial release also nourishes tissues by increasing blood circulation, reduces muscle tensions, improves joint mobility, increases muscle performance and endurance, releases trigger points, improves proprioception and motor coordination, and reduces myofascial tension [10].

Rules of self-myofascial release

Initially, the rolling should start with medium pressure, body weight partially supported by upped limbs, gradually increasing pressure until individual pain threshold is reached. Rolling should be done slowly, a maximum of 2.5 cm per second. When painful points are found, the roller should be stopped on them and muscles should be relaxed. Discomfort and pain should gradually reduce after approximately 30 seconds, often to complete pain elimination. Massage balls are highly suitable for local relaxation of smaller structures and can be used for pressure therapy of trigger points. The intensity of the rolling depends on the condition of the tissues and patient's pain tolerance. The painful points must not be rolled too hard to avoid damaging the muscle fibers, and bony structures must be carefully omitted. 12 repetitions of self-myofascial release should be performed in one session [11].

Contraindications for self-myofascial release: tumors, elevated temperature, tissue rupture at the massage point, acute inflammation, advanced osteoporosis, advanced diabetes, and aneurysms [12].

The suggested set of exercises and self-therapy is designed to normalize the tension within the soft tissues, as well as to create proper space for the branches of the sciatic nerve. This physiotherapy will help relief the pain as well as eliminate both the symptoms and the source of the problem.

Examples of self-myofascial release using a roller and massage balls (Figures 5-7)

Figure 5. Global rolling of the hamstrings muscle group (left) and global rolling of the lateral side of the thigh including tensor fasciae latae and iliotibial band (right).

Figure 6. Global rolling of the front side of the thigh (left) and global rolling of the deep rotator muscles involving the piriformis muscle (right).

Figure 7. Global rolling of the deep rotator muscles involving the piriformis muscle (left) and local rolling of the piriformis muscle (right).

Examples of stretching exercises for piriformis syndrome

→ Starting position: Supine positioning, the foot of the lower limb being stretched over the knee of the opposite lower limb. Knee positioned outwards. The upper limbs grip the thigh of the non-exercised lower limb. Movement: bend at the hip joint until a pulling sensation is felt. Hold position for 10 seconds (**Figures 8 and 9**).

Figure 8. Stretching of the piriformis muscle – starting position (upper) and adequate movement (lower).

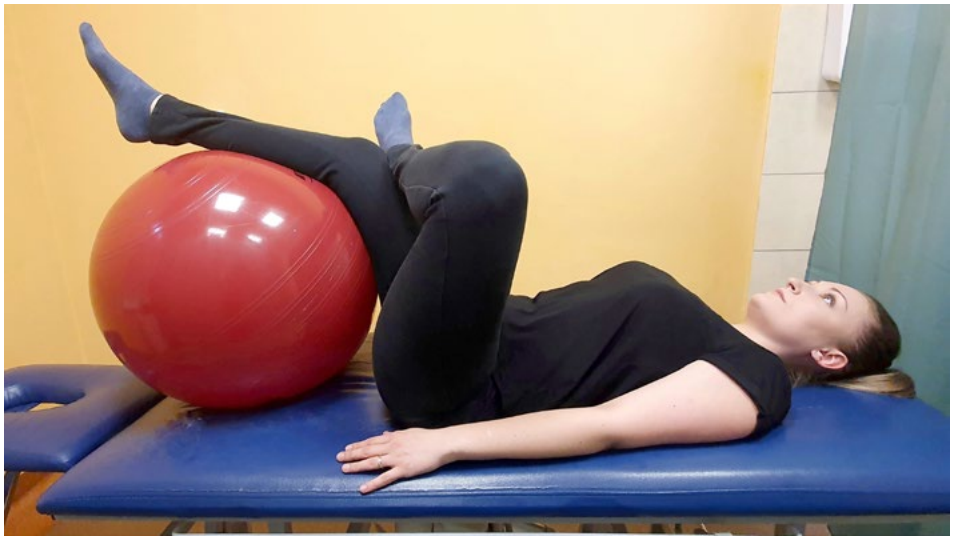

Figure 9. Stretching of the piriformis muscle using a rehabilitation ball – starting position (upper) and adequate movement (lower).

→ Starting position: Supine positioning. The non-exercised lower limb straight/bent at the knee at a 90-degree angle. The foot of the exercised lower limb over the non-exercised lower limb. Movement: pulling the knee of the exercised lower limb to the opposite shoulder (**Figure 10**).

Figure 10. Stretching of the piriformis muscle to the opposite shoulder – starting position (upper) and adequate movement (lower).

→ Starting position: Supine positioning. The exercised lower limb bent at the hip and knee joint at a 90-degree angle. The upper limbs grip the thigh of the exercised lower limb. The opposite lower limb straight. Movement: slow movements of internal and external rotation (**Figure 11**).

Figure 11. Mobilization of the rotators muscles – external rotation (upper) and internal rotation (lower).

→ Starting position: Supine positioning. The non-exercised lower limb straight. The foot of the exercised lower limb on the outside of the knee joint of the non-exercised lower limb. Movement: pulling the knee joint toward the lounger. Hold the position for a few seconds (**Figure 12**).

Figure 12. Stretching of the piriformis muscle.

→ Starting position: Sitting position, exercised lower limb in flexion and external rotation at the hip joint. Knee bent at 90-degree angle. The opposite lower limb in abduction at the hip joint and flexion at 90-degree angle at the knee joint. Movement: tilting the trunk towards the exercised lower limb (**Figure 13**).

Figure 13. Stretching of the piriformis muscle in the sitting on the rehabilitation table – starting position (left) and adequate movement (right).

→ Starting position: Sitting on a chair. The foot of the lower limb exercised over the knee of the opposite lower limb. Knee positioned outwards. Movement: tilting the trunk towards the non-exercised lower limb. Hold position for 10 seconds (**Figure 14**).

Figure 14. Stretching of the piriformis muscle in the sitting on the chair – starting position (left) and adequate movement (right).

→ Starting position: Standing up facing the lounger. Exercised lower limb in flexion and external rotation on a lounger. Movement: bending the trunk forward (**Figure 15**).

Figure 15.
Stretching of the piriformis muscle in standing – starting position (left) and adequate movement (right).

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