Review Articles

Piriformis syndrome: Does it bother your daily life?

Thanitsara Wetchateng

Abstract

Piriformis syndrome (PS) defined as sciatica caused by the compression of the sciatic nerve by the piriformis muscle (PM). Typical symptoms of PS are external tenderness over the greater sciatic notch, sciatic pain limited to the buttock with radiation down to the leg, with no sensory deficits. Except in the more chronic presentations where secondary disuse atrophy may be presented. PS has frequently been described as being exacerbated by prolonged sitting and walking. The investigators described six key features of the PS: a history of trauma or direct fall to the buttock; difficulty walking; worsening with squatting or lifting; a sausage-like mass within the muscle; positive straight leg raising test (SLR test) and gluteal atrophy. The PS affects the quality of everyday life. Chronic pain and muscle fatigue result in more incidences of sick leave and higher cost of treatment. The piriformis syndrome is frequently misdiagnosed for more common conditions. The diagnosis is largely clinical and is one of exclusion. Spinal stenosis, lumbar muscle strain, facet arthropathy and herniated nucleus pulposus (HNP) must be ruled out. This review will mainly focus on the specific physical factors relevant to the piriformis syndrome when evaluating a possible causal relationship to the piriformis muscle and the sciatic nerve.

Key words: Piriformis syndrome, Piriformis muscle, Sciatic nerve, Buttock pain

Received: 21 February 2013 Accepted: 22 March 2013

Division of Anatomy, Department of Preclinical Science, Faculty of Medicine, Thammasat University

Introduction

In 1928, Yeoman et al. first described the clinical feature of what would later be called "piriformis syndrome".[1] Piriformis syndrome (PS) is described as the uncommon cause of low back pain and sciatica which results from entrapment and/or irritation of the sciatic nerve of the greater sciatic foramen region.[2-6] The piriformis muscle travels from the pelvis to the outer hip. The sciatic nerve usually passes the hip between this muscle and other muscles of the hip. In some cases (15-20%), the nerve travels directly through the muscle causing pressure on the nerve.[2-6] There were reported that PS is more common in women than in men, possibly because of the biomechanics associated with the wider quadriceps femoris muscle angle ("Q angle"; a position patient in slight knee flexion 15 degrees) in the os coxae (pelvis) of women.[7, 8] An abnormal condition of the piriformis muscle (PM) is most often considered a causative factor for this syndrome though no definitive causative factors have been found. Trauma to the PM resulting in spasms, edema and contracture of the muscle which can cause subsequent compression and entrapment of the sciatic nerve are the most common sources of the problem.[3] One explanation suggests that the PM tendon may be tethering the sciatic nerve, causing an irritation to the nerve. While it has not yet been officially proven, some physicians agree that the sciatic nerve is strangled when the PM and its tendon are too tight. The result may be a decrease of blood flow to the nerve causing considerable irritation because of the pressure.[8] Stretching and shortening of the PM leading to PS may be the result of altered biomechanics of the lower limb, low back, and pelvic regions. Moreover, the piriformis can be spastic, inflamed[9, 10] or it can be seen as myofascial syndrome[11] or as myositis ossificans.[12] The compression of the sciatic nerve by the piriformis is identical in clinical presentation to low back pain with associated L5, S1 radiculopathy with foraminal narrowing.[8, 13] PS had been thought to be a purely clinical diagnosis; but more recently, magnetic resonance imaging (MRI) has begun to be used to help with the diagnosis of this problem.[2, 14] Deep buttock pain with the absence of sciatic pain flowing down the leg can also be the result of tightness of the piriformis muscle and hip abductor muscles. Understanding the cause of symptoms and accurate diagnosis is essential for the prevention and treatment for the patient to work and live a normal routine.

What is piriformis syndrome?

Epidemiologic data on piriformis syndrome is inconsistent, but it is estimated to be responsible for 6-8% of the yearly cases of low back pain and sciatica in the USA.[15] The PS is a condition in which the PM irritates the sciatic nerve, causing pain in the buttock and referring pain along the course of the sciatic nerve. The sciatic nerve runs very close to this muscle and in some people (around 10% of the population) it passes straight through the muscle fiber.[2, 16] If the PM becomes tight it can put pressure on the sciatic nerve and cause pain which can radiate down the leg and calf, commonly known as sciatic pain. It has been suggested that this condition would be better referred to as piriformis impingement due to the impingement of the sciatic nerve. Tight abductor muscles are common symptoms of PS. This may cause the abductors on the outside to not work properly and put more strain on the PM. Some investigators found that "short leg" is one of the rare causes of PS and can be seen alone or with the other causes.[16] In 1947 Robinson introduced the term piriformis muscle based on six characteristics: 1) trauma 2) pain in the muscle, with sciatica and difficulty walking 3) worsening with squatting or lifting 4) a sausage-like mass within the muscle 5) positive Lase`gue's sign 6) gluteal atrophy.[10, 15, 16] Some investigators considered PS to be a form of myofascial pain syndrome.[11] Sciatica may also be the result of disease in the lumbar spine, chronic hamstring tendinitis, and fibrous adhesions of other muscles around the sciatic nerve. The exact causes of PS are unknown. Other possible symptoms of sciatica include: 1) muscle spasm in the PM, either because of whether that be irritation in the PM itself, or irritation of a nearby structure such

as the sacroiliac joint or hip 2) tightening of the muscle, in response to injury or spasm 3) swelling of the PM, due to injury or spasm 4) bleeding in the area of the PM. Any one or combination of the above problems can affect the PM and may affect the adjacent sciatic nerve (causing pain, tingling, or numbness in the back of the thigh, calf, or foot).[17] The PS is diagnosed primarily on the basis of symptoms and on the physical examination. Freiberg test has been used to reveal PS[18]. During this test, the physician performs flexion, adduction and medial rotation of the hip in the supine position. An increase in pain during this stretch test assists in the diagnosis of PS by the physician. Straight-leg-raising (SLR) tests are positive because the sciatic nerve is entrapped. There are no tests that accurately confirm the diagnosis, but X-rays, MRI, and nerve conduction tests may be necessary to exclude other diseases. Many of these diagnostic criteria have been disputed since that time, and today PS is typically characterized as a syndrome consisting of isolated sciatic pain limited to the buttock with no sensory deficits.[11, 14, 15] Because PS is primarily a diagnosis of exclusion that is based on clinical presentation. Physical examination should focus on pain location, inspection, range of motion, spine and muscle palpation, strength, sensation, and reflexes in both legs.

Anatomy of piriformis muscle

The piriformis muscle (PM) is small compared to other muscles around the hip and thigh. The PM and its tendon have an intimate relationship to the sciatic nerve, the largest nerve in the body which supplies the lower extremities with motor and sensory functions. The piriformis tendon and sciatic nerve cross each other behind the hip joint, in the deep buttock. The fiber of the PM is flat, pyramid-shaped and oblique. This muscle originates at the anterior of the S2-S4 vertebrae, the sacrotuberous ligament and the upper margin of the greater sciatic foramen. Passing through the greater sciatic notch, the muscle inserts on the superior surface of the greater trochanter of the femur. Several variations describing the relationship between the sciatic nerve emerging from the greater sciatic foramen (Figure 1) have been noted.[1, 19] The most common variation, which occurs in more than 10% of the population is the common fibular portion of the sciatic nerve emerging through the piriformis muscle. Contraction of PM with the hip extended, the PM is the primary external rotator; however, with the hip flexed, the muscle becomes a hip abductor. The PM is innervated by branch of ventral rami of S1 and S2,[20] which join to form the nerve to the PM. The PM lies on the sciatic nerve as both structures exit the pelvis via the greater sciatic foramen, where it confines the sciatic nerve to a potentially tight compartment.[14]

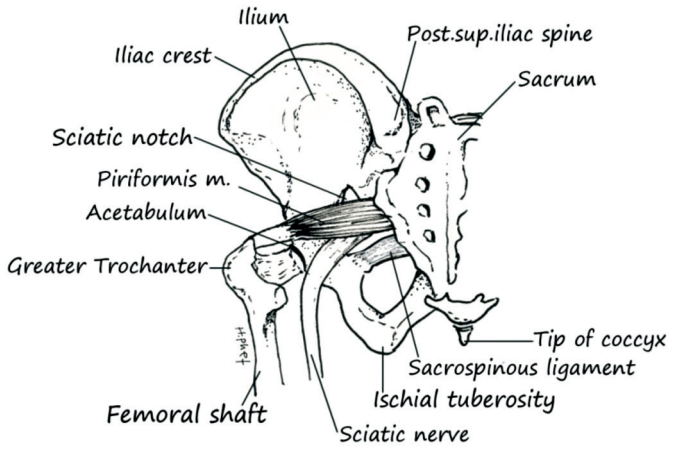

Figure 1 The normal relationship of the piriformis muscle and the sciatic nerve as they exit the pelvis through the greater sciatic foramen is seen in this posterior view of the pelvic region.

An investigation of the relationship between the sciatic nerve and PM was conducted in 2002 by Loren M and colleagues. Of 76 cadavaric legs dissected and examined it was reported that of 11 (14%) anomalous passages were found, 10 (13%) were bilateral. A recent meta-analysis was able to show no increased risk of piriformis syndrome in variations of how the sciatic nerve exits the pelvis through the greater sciatic foramen in relation to the PM, which indicates that this anomaly may not be as important in the pathogenesis of piriformis syndrome as previously thought.[19]

Symptoms of piriformis syndrome

The location of the pain is typically imprecise, but it is often present in the hip, coccyx, buttock, groin, or distal part of the leg, sometime finding the pain to be directly over the tendon of the PM.[16] Pain and tenderness at the greater sciatic notch or over the PM belly in the buttock, hip or back of the thigh and sometimes to the knee. Pain may radiate down the back of the leg, usually into the hamstrings and sometimes even the calf muscles. It is common for pain to initially be confused with a hamstring strain or hamstring origin tendinopathy. In some case reduced range of motion of the hip joint, especially into internal hip rotation occurred. Tingling, numbness, or burning in the back of the thigh to the knee and occasionally the bottom of the foot, heaviness or fatigue of the leg. Pain that is worse with sports activities, such as running, jumping, long walks, and walking up stairs or hills, and is often felt at night or with prolonged sitting on hard surfaces with wallet in the back pocket.[9]

Is there any treatment for piriformis syndrome?

Traditional methods using physical therapy, corticosteroid and local anesthetic injections have proven to be effective in some studies but not in all cases.[21] Historically, treatment for PS included stretching and physical therapy modalities, with refractory patients also receiving anesthetic and corticosteroid injections into the PM origin, belly, muscle sheath, or sciatic nerve sheath. The symptomatic relief of muscle and nerve pain using nonsteroidal anti-inflammatory drugs, muscle relaxants, and neuropathic pain agents is a conservative treatment plan of PS. A common treatment plan involves piriformis stretching, which aims to correct the underlying pathology by relaxing a tight piriformis, along with related muscle stretching to relieve nerve compression.[11] Because the piriformis lies deep in the gluteus maximus, using moist heat or ultrasound prior to stretching is most often suggested.[22] Stretching exercises involving hip and knee flexion, hip adduction and internal rotation of the thigh (FAIR position) may be done in both the standing and supine positions. Injection techniques have been described as involving a combination of electromyography (EMG), fluoroscopy, computed tomography (CT), magnetic resonance imaging (MRI), ultrasound, and peripheral nerve stimulator guidance.[5-7] The use of botulinum toxin (BTX) to treat PS has gained popularity in more current diagnosis. One logical choice of treatment appears to be BTX because it reverses the presumed underlying pathophysiology of PS (muscle weakness, atrophy and relief of sciatic nerve compression). BTX treatment focuses on relieving sciatic nerve compression and inherent muscle pain from a tight piriformis. BTX is increasingly being used for myofascial pain syndrome and some studies have demonstrated superior efficacy to cortiocosteroid injection.[13, 23] Though corticosteroid and lidocaine injections may provide enough temporary analgesia to allow patients to participate in physical therapy, they do not correct the underlying pathophysiology of PS and often need to be repeated. In refractory cases, surgical dissection of the sciatic nerve or splitting of the piriformis muscle may be indicated. However, surgery is used as a last resort for patients who do not respond to conservative therapy or injection.[13, 23] Over and beyond this the obturator internus, gemelli, and quadratus femoris muscles can compensate for the loss of piriformis function because these muscles share common insertions with the PM.[22]

Conclusion

In conclusion there are no studies reporting an established pathology in enough patients to satisfactorily validate the existence of piriformis pathology and anatomical causes of piriformis syndrome are rare. The piriformis

syndrome is one of a number of conditions that may give rise to sciatica. However, it is necessary to avoid a specific diagnosis when one is insufficiently supported. The investigators state that stretching is almost always needed to relax the piriformis and relieve the sciatic pain. Understanding the cause of symptoms and accurate diagnosis is essential for the prevention and treatment for the patient to work and live a normal routine.

Acknowledgements

The author gratefully appreciates Mrs. Chutima Dussadeeprecha for her valuable contributions in drawing a picture for this article.

References

1. Yeoman W. The relation of arthritis of the sacroiliac joint to sciatica: with an analysis of 100 cases. Lancet 1928;2:1119-22.
2. Chapman C, Bakkum BW. Chiropractic management of a US Army veteran with low back pain and piriformis syndrome complicated by an anatomical anomaly of the piriformis muscle: a case study. J Chiropr Med 2012;11:24-9.
3. Adams A, Caldwell SG, Hurwitz EL. Piriformis syndrome: an annotated bibliography. J Can Chiropr Assoc 1999;43:176-82.
4. Rodrigue T, Hardy RW. Diagnosis and treatment of piriformis syndrome. Neurosurg Clin N Am 2001; 12:311-9.
5. Mehta S, Auerbach JD, Kingsley RC. Interventional spine: an algorithmic approach; Piriformis syndrome. Philadelphia: Saunders/Elsevier; 2008. 1346-54.
6. Boyajian-O'Neill LA, McClain RL, Coleman MK, Thomas PP. Diagnosis and management of piriformis syndrome: an osteopathic approach. J Am Osteopath Assoc 2008;108:657-64.
7. Kim JE, Kim KH. Piriformis syndrome after percutaneous endoscopic lumbar discectomy via the posterolateral approach. Eur Spine J 2011;20:1663-8.
8. Papadopoulos EC, Khan SN. Piriformis syndrome and low back pain: a new classification and review of the literature. Orthop Clin North Am 2004;35:65-71.
9. Gunther W, Eva Maria B, Friedrich A. Piriformis muscle: clinical anatomy and consideration of the piriformis syndrome. Surg Radiol Anat 2007;29:37-45.
10. Robinson DR. Piriformis syndrome in relation to sciatic pain. Am J Surg 1947;73:355-8.
11. Porta M. A comparative trial of botulinum toxin type A and methyprednisolone for the treatment of myofascial pain syndrome and pain from chronic muscle spasm. Pain 2000;85:101-5.
12. Beauchnese RP, Schutzer SF. Myositis ossificans of the piriformis muscle; an unusual case of piriformis syndrome, a case report. J Bone Joint Surg (Am) 1997;79:906-10.
13. Benzon HT, Katz JA, Benzon HA, Iqbal MS. Piriformis syndrome: anatomic consideration, a new injection technique, and a review of the literature. Anesthesisology 2003;98:1442-8.
14. Lee EY, Margherita AJ, Gierada DS, Narra VR. MRI of piriformis syndrome. AJR Am J Roentgenol 2004;183:63-4.
15. Fishman LM, Anderson C, Rosner B. BoTox and physical therapy in the treatment of piriformis syndrome. Am J Phys Med Rehabil 2002;81:936-42.
16. Dere K, Akbas M, Luleci N. A rare cause of a piriformis syndrome. J Back Musculoskelet Rehabil 2009;22:55-8.
17. Revord JP. What is piriformis syndrome? [Internet]. 2000 [cited 2000 April 1] Available from: http://www.spine-health.com/conditions/sciatica/what-piriformis-syndrome.
18. Freiberg AH. Sciatic pain and its relief by operation on muscle and fascia. Arch Surg 1937;34:337-49.
19. Smoll RN. Variations of the piriformis and sciatic nerve with clinical consequence: a review. Clin Anat 2010;23:8-17.

20. Moore KL, Dalley FA, Agur AMR. Clinically Oriented Anatomy. International edition. 6th ed. Philadelphia: Lippincott Williams & Wilkins; 2010. p 564.
21. Parziale JR, Hudgins TH, Fishman LM. The piriformis syndrome. Am J Orthop 1996;25:819-23.
22. Kirschner JS, Foye PM, Cole JL. Piriformis syndrome, diagnosis and treatment. Muscle & Nerve 2009; 40:10-8.
23. Mizuguchi T. Division of the piriformis muscle for the treatment of sciatica. Postlaminectomy syndrome and osteoarthritis of the spine. Arch Sug 1976; 111:719-22.

บทคัดย่อ

กลุ่มอาการพิริฟอร์มมิส โรคปวดสะโพกที่รบกวนคุณภาพชีวิต

ธนิศรา เวชเดง
สาขากายวิภาคศาสตร์ สถานวิทยาศาสตร์พรีคลินิก คณะแพทยศาสตร์ มหาวิทยาลัยธรรมศาสตร์

กลุ่มอาการพิริฟอร์มมิส หมายถึงกลุ่มอาการที่เกิดจากเส้นประสาทซายอะติกถูกกดทับโดยกล้ามเนื้อพิริฟอร์มมิส ผู้ป่วยมีอาการปวดบริเวณสะโพกโดยเฉพาะบริเวณที่อยู่เหนือ greater sciatic notch อาการปวดนี้จำกัดอยู่เฉพาะบริเวณสะโพก หรืออาจจะปวดร้าวลงไปยังขา แต่ไม่มีการสูญเสียระบบประสาทรับความรู้สึก ยกเว้นผู้ป่วยที่มีอาการปวดเรื้อรังเป็นเวลานานจนทำให้กล้ามเนื้อลีบ กลุ่มอาการพิริฟอร์มมิสส่วนใหญ่มักเกิดจากการนั่งหรือเดินเป็นเวลานาน ลักษณะสำคัญของกลุ่มอาการพิริฟอร์มมิสมี ๖ ประการ ได้แก่ ๑) มีประวัติการได้รับบาดเจ็บหรือหกล้มบริเวณสะโพก ๒) เดินลำบาก ๓) อาการแย่ลงเมื่อนั่งยองหรือก้มยกของ ๔) คลำพบก้อนลักษณะคล้ายไส้กรอกบริเวณกล้ามเนื้อสะโพก ๕) การทดสอบ straight leg raising (SLR test) ตรวจพบผลบวก และ ๖) กล้ามเนื้อบริเวณสะโพกลีบ กลุ่มอาการพิริฟอร์มมิสส่งผลต่อคุณภาพชีวิตของผู้ป่วยเนื่องจากมีอาการปวดและกล้ามเนื้ออ่อนแรงเรื้อรัง ทำให้ต้องได้รับการรักษาอย่างต่อเนื่องและมีค่าใช้จ่ายในการรักษาสูง กลุ่มอาการนี้มักถูกมองข้ามและไม่ได้รับการวินิจฉัย เนื่องจากการวินิจฉัยเบื้องต้นต้องวินิจฉัยจากอาการ โดยแพทย์ต้องแน่ใจว่าไม่ใช่โรคดังต่อไปนี้ ได้แก่ กระดูกสันหลังตีบ (spinal stenosis) อาการปวดที่เกิดจากกล้ามเนื้อเอว (lumbar muscle strain) พยาธิสภาพในข้อต่อ facet (facet arthropathy) และหมอนรองกระดูกเคลื่อน (herniated nucleus pulposus, HNP) บทความนี้เป็นการรวบรวมและทบทวนข้อมูลเกี่ยวกับปัจจัยทางกายภาพที่เกี่ยวข้องกับพยาธิกำเนิดของกลุ่มอาการพิริฟอร์มมิส โดยเน้นความสัมพันธ์ระหว่างกล้ามเนื้อพิริฟอร์มมิสและเส้นประสาทซายอะติก

คำสำคัญ: กลุ่มอาการพิริฟอร์มมิส, กล้ามเนื้อพิริฟอร์มมิส, เส้นประสาทซายอะติก, อาการปวดสะโพก