

Piriformis syndrome: an annotated bibliography

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Objective: *To review the literature on Piriformis Syndrome, including signs, symptoms, diagnosis, differential diagnosis, treatment and management.*

Design: *An annotated bibliography.*

Methods: *A literature search of MEDLINE from January 1987 to November 1996, MANTIS from 1990 to 1997, EMBASE from January 1986 to December 1996, and Index to Chiropractic Literature from 1985 to 1994. The key words utilized in the search were Piriformis, Piriformis Syndrome, and Piriformis Muscle. Only English language articles were selected.*

Results: *This annotated bibliography identifies twelve case reports, four case series, nine commentaries, and one quasi experiment. Twenty of the articles were published in peer-reviewed journals.*

Conclusions: *Future research should address diagnostic criteria, treatment protocols, and effectiveness of therapeutic options.*
(JCCA 1999; 43(3):176-182)

KEY WORDS: piriformis, muscle, syndrome.

Objectif : *Passer en revue la documentation scientifique sur le syndrome du pyramidal, notamment sur les signes et les symptômes, le diagnostic, le diagnostic différentiel, le traitement et la prise en charge.*

Procédé : *Bibliographie annotée.*

Méthode : *Recherche documentaire dans quatre bases de données : MEDLINE, de janvier 1987 à novembre 1996; MANTIS, de 1990 à 1997; EMBASE, de janvier 1986 à décembre 1996 et Index to Chiropractic Literature, de 1985 à 1994. Les mots clés utilisés dans la recherche étaient « Piriformis » (piriforme), « Piriformis Syndrome » (syndrome du pyramidal) et « Piriformis Muscle » (muscle pyramidal du bassin). Seuls les articles écrits en anglais ont été retenus.*

Résultats : *La bibliographie annotée a permis de relever douze exposés de cas, quatre séries de cas, neuf commentaries et une quasi-expérience. Vingt des articles choisis ont été publiés dans des revues où l'examen par les pairs est pratique courante.*

Conclusion : *Il faudrait faire plus de recherche sur les critères diagnostiques, les protocoles de traitement et l'efficacité des différents moyens thérapeutiques.*
(JACC 1999; 43(3):176-182)

MOTS CLÉS : pyramidal, muscle, syndrome.

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Introduction

A comprehensive search was conducted using MEDLINE from January 1987 to November 1996, MANTIS (formerly ChiroLars) from 1970–1997, EMBASE from January 1986 to December 1996, and CINAHL from 1982–1997. The key words used in the search were *Piriformis*, *Piriformis Syndrome*, and *Piriformis Muscle*. Only English language articles were selected. The abstracts or articles were reviewed to determine their relevance to this study's objectives.

Forty-one articles were identified, of which twenty-six articles were considered to be relevant to this study. Most of the articles were retrieved from the Los Angeles College of Chiropractic's Learning Resources Center, 3 from University of California Medical Center and 1 from the University of Texas, South-West Medical Center. This annotated bibliography contains twelve case reports, four case series, nine commentaries, and one quasi experiment.

Piriformis Syndrome is a subject of much controversy. The clinical dilemma is in the diagnosis of piriformis syndrome. Missed diagnoses may lead to prolonged pain and/or unnecessary surgery. The exact etiology for patients' signs and symptoms of Piriformis Syndrome is not clear. One theory is that trauma sustained to the piriformis muscle creates an inflammatory response, causing the muscle and fascia to swell, compressing the sciatic nerve (3, 6, 8, 9, 10, 17). Another theory is that the symptoms are produced by a myofascial trigger point in the piriformis muscle, also secondary to trauma (4, 12, 14, 20, 21). A unique theory proposed by Sterner et. al. is that patients' symptoms are a result of a chemical epineurial irritation (22).

Based on our findings, future research should address diagnostic criteria, risk factors, effectiveness of therapeutic options, and preventive measures. Piriformis Syndrome will remain a nebulous clinical entity until well designed and executed studies are performed to confirm its existence and related diagnostic tests are deemed reliable and valid.

CASE REPORTS

1 Nell SS, Jheeta GS.

Piriformis Syndrome.

Am J Chiro Assoc 1986; 20:32–35.

The authors present a case of a 37-year-old female with right sided piriformis syndrome and dysfunctional sacroiliac joint motion which resulted from a lifting injury at work twelve years prior. The patient's symptoms were right trochanteric pain, right sacroiliac joint pain, pubic region pain, and pain in the right lower quadrant. This patient had been seen by three obstetricians, two neurologists, her regular physician, and a physiotherapist. Multiple tests were performed, ranging from pelvic sonogram, laparotomy, x-ray, blood work up, and CT scan. All tests were reported negative. The authors provided a step by step tract of treatment for each visit; on the tenth visit the patient reported "100%" improvement. This author states the patient was put on a precise treatment program to "break" the trigger spasm in the piriformis muscle.

2 Nakano KK.

Keep compression neuropathy in your differential of sciatic pain. Sciatic nerve entrapment: The piriformis syndrome.

J Musculoskeletal Medicine 1987; 33–37.

This is a case report of a 33-year-old woman avid jogger with left sided piriformis syndrome. Her symptoms were left sided gluteus pain with pain radiation and paresthesia down the left posterior thigh and foot. Computed tomography (CT) and electromyographic (EMG) studies were reported normal. After three months of failed conservative measures the patient underwent operative dissection to the compressive portion of the piriformis, which provided relief of symptoms. In this article the author described a list of differential diagnoses of more well known causes of sciatic pain such as lumbar disc herniation, spinal stenosis, and sciatic nerve entrapment. The diagnostic tests and management for piriformis syndrome were briefly discussed.

3 Nainzadeh N, Lane ME.

Somatosensory evoked potentials following pudendal nerve stimulation as indicators of low sacral root involvement in a post-laminectomy patient.

Arch Phys Med Rehabil 1987; 68:170–172.

This is a case report of a 33-year-old man who developed low-back pain after a work-related accident. Four months later, a myelogram and CAT scan showed evidence of a “bulging disc” at L4-L5 on the right. A decompressive laminectomy was performed with no relief of symptoms. Four months later a repeat myelogram and CAT scan did not reveal a disc herniation. One year later the patient developed urinary incontinence and an emergency cystogram was performed. A diagnosis of impending cauda equina syndrome was established. The patient started steroid treatment with subsequent improvement; however, four weeks later he was readmitted for urinary incontinence secondary to urinary retention. At this time an emergency decompression was obtained by tenolysis of the piriformis muscle belly tendon. The patient dramatically improved after 24 hours. The authors concluded that somatosensory evoked potential (SEP) was able to detect an important preoperative segmental abnormality which gave a rationale for the piriformis release.

4 Brown JA, Braun MA, Namey TC.

Piriformis Syndrome in a 10-year-old boy as a complication of operation with the patient in the sitting position.

Neurosurgery 1988; 23(1):117–119.

In this case report the authors divulge a rare postoperative complication. This 10-year-old boy underwent a cerebellar pilocytic astrocytoma procedure lasting 11 hours in the seated position after which the boy developed pain in the sciatic distribution. The patient was treated with piriformis muscle block injection of lidocaine hydro-chloride, betamethasone sodium phosphate and betamethasone acetate suspension and Sarapin with immediate pain relief. A three-month treatment of Naproxen and physiotherapy provided complete recovery of strength and resolution of pain.

5 Papadopoulos SM, McGillicuddy JE, Albers JW.
Unusual causes of “Piriformis Syndrome”.

Arch Neurol 1990; 47; 1144–1146.

The authors describe a 40 year-old female who developed clinical signs and symptoms suggestive of piriformis syndrome 1 week following a gynecologic transvaginal needle biopsy. A CT scan showed a mass interpreted as an intramuscular hematoma in the piriformis muscle. Because of persistent pain and progressive neurologic deficit, a decompressive operation was pursued at which time a pseudoaneurysm of the inferior gluteal artery was discovered. One year later the patient reported no pain with complete recovery from her neurologic deficits.

6 Jankiewicz JJ, Henrikus WL, Houkom JA.

The appearance of the Piriformis Muscle Syndrome in computed tomography and magnetic resonance imaging. A case report and review of the literature.

Clinical Orthopaedics and Related Research 1991; 262:205–209.

The purpose of the report was to present the case of a 27-year-old female with right side piriformis syndrome in which the diagnosis was supported by computed tomography demonstrating an enlarged piriformis muscle, and magnetic resonance imaging demonstrating a homogeneous muscle density and enlargement. The patient’s symptoms were described as chronic, aching pain in her right buttock, and ipsilateral posterior thigh pain following a fall. The pain increased with walking, squatting and sexual intercourse, but not with coughing or sneezing. This patient had a positive “Freiberg’s sign, Pace’s sign, and Lasegue’s sign” (Freiberg’s sign is passive internal rotation of the leg; Pace’s sign is resistance to abduction and external rotation of the thigh.). Pelvic and rectal examination produced severe tenderness, hence the diagnosis of piriformis syndrome. An injection of lidocaine and sterile triamcinolone acetonide suspension in the piriformis muscle trigger point brought complete relief.

7 Myers KP, Thomas R, Barker L.

Sciatica of muscular origin in a recreational runner: a case report.

Chiropractic Sports Medicine 1991; 5(2):31–33.

In this case report, a 23-year-old female recreational runner had initially been diagnosed and treated for sciatic pain caused by the left piriformis. Symptoms returned after the patient resumed running, indicating a missed diagnosis. After re-examination the authors proposed a muscular cause of sciatica which could also be caused by a hypertonic gluteus maximus.

8 Vandertop WP, Bosma NJ.

The Piriformis Syndrome; a case report.

J Bone Joint Surgery 1991; 73-A(7):1095–1096.

The authors describe a case in which a 51-year-old male patient presented with tingling sensations extending from the left hip along the posterolateral aspect to the left thigh and calf to the fourth and fifth toes. Upon exploratory surgery, the sciatic nerve was found entrapped deep in the piriformis muscle and was successfully treated with sectioning the piriformis muscle and the overlying fibrous band. The authors emphasize that, “the diagnosis of piriformis syndrome is entirely clinical.”

9 Chen W.

Bipartite Piriformis muscle: an unusual cause of sciatic nerve entrapment.

Pain 1994; 58:269–272.

The author discusses a 28-year-old woman with left side sciatica. Following a computerized tomography of the pelvis, a bipartite piriformis muscle was confirmed. The patient was treated by dissection of the lower head of the piriformis muscle, with subsequent sciatic resolution.

10 Sayson SC, Ducey JP, Maybrey JB,

Wesley RL, Vermilion D.

Sciatic entrapment neuropathy associated with an anomalous piriformis muscle.

Pain 1994; 59: 149–152.

In this case, a 38-year-old woman presented with persistent pain from her left sacroiliac region into her buttock and hip. Associated symptoms were numbness on the left lateral thigh and paresthesiae down the posterior knee and calf. Her symptoms were intensified with walking, bending, sitting or laying on the involved side, and sexual inter-

course. The patient responded poorly to a series of epidural steroid injections. Temporary relief was provided with sacroiliac injection, transient relief to piriformis intramuscular anesthetic and steroid injection. Surgical exploration revealed an anomalous piriformis muscle. Sectioning of the muscle and band yielded complete resolution of the patient’s symptoms.

11 Merio IM, Poloni TE, Alfonsi E,

Messina AL, Ceroni M.

Sciatic pain in a young sportsman.

Lancet 1997; 349:846.

This was a very brief case report of a 33-year-old man with right side sciatic pain exacerbated by physical activity. This patient received bupivacaine injection into the piriformis muscle, with only temporary relief. During exploratory surgery a loop in the inferior gluteal artery was detected compressing the sciatic nerve. The nerve and artery were separated and a Groetex patch was placed between them. Following surgery, the patient reported being pain free.

12 Lamb KL.

Sacroiliac joint dysfunction with associated piriformis syndrome mimicking intervertebral disc syndrome resulting in failed low back surgery.

Chiropractic Technique 1997; 9(3):128–132.

A case report is described with emphasis on the importance of proper assessment in the diagnosis of lumbar pain generators in order to avoid an erroneous diagnosis and unnecessary surgery, as well as proper application of conservative treatment for piriformis syndrome. The author discussed the examination, diagnosis, and treatment of a 57-year-old female who was diagnosed with left sacroiliac joint subluxation with associated myofascial pain syndrome in the left piriformis and gluteus minimus muscle. Twelve months prior this patient underwent a microsurgical disc excision at L5, which provided pain relief for only 14 days.

CASE SERIES

13 Mizuguchi T.

Division of the piriformis muscle for the treatment of sciatica.

Post-laminectomy syndrome and steoarthritis of the spine.

Arch Surg 1976; 111:719–722.

In this article the author believes that piriformis syndrome is a secondary disorder which exaggerates the primary spinal pathology. The author studied 14 post-laminectomy patients with sciatic pain who also underwent division of the piriformis muscle at its tendinous insertion. Eighty-five percent of these patients reported “satisfactory” results.

14 Maxwell TD.

The piriformis muscle and its relation to the long legged sciatic syndrome.

J Can Chiropr Assoc 1987; 51–55.

The author describes the anatomy of the piriformis muscle depicting 7 varying relations between the sciatic nerve and the piriformis muscle. The symptoms of piriformis syndrome include low back pain, sacral pain, gluteal region pain and pain down the posterior upper leg with paraesthesias above and below the knee. The patients were treated with trigger point therapy and a hip adjustment. There were 3 illustrative cases presented. Case 1 described a 50-year-old female with low back, buttock and right leg pain. Previous care consisted of medications, physiotherapy and chiropractic care. Case 2 was also a female who complained of pain in her right hip and leg after a flu shot. Case 3 was a 26-year-old female complaining of severe pain in the left leg and buttock after a volleyball game. The patients all reported being “symptom-free” at the time of discharge.

15 Barton PM.

Piriformis syndrome: a rational approach to management.

Pain 1991; 47:345–352.

In this article the author states that piriformis syndrome is a common yet rarely recognized condition. Barton goes on to describe four case studies with systematic management plans with reports of good outcomes. Case 1 was a 31-year-old woman with right sided buttock pain after

shoveling snow. Radiographs of lumbosacral spine were unremarkable. After 1 week of stretching every 2 waking hours, she had “significant” relief of buttock and low back symptoms. Case 2: A 40-year-old male social worker developed back ache radiating into his thighs bilaterally after strenuous activity. This patient was treated with injection of betamethasone sodium phosphate, betamethasone acetate and lidocaine HCL into the piriformis tendon. The patient reported buttock pain had resolved one day after injection. Case 3: A 32-year-old male physician and marathon runner with increasing left low back and left buttock pain and occasional radiation to the posterior knee. This patient was treated with L5 facet injection (which resolved his low back pain) and piriformis muscle injection with complete resolution of remaining symptoms. Case 4: A 39-year-old dental assistant with right buttock radiating to the right greater trochanter and hip pain. This patient was given a 1 cm left heel lift, underwent a trial of ultrasound and two piriformis injections which were unsuccessful. She was referred for piriformis release and was placed on a program to increase her hip range of motion and right hip strength. After 27 months, she reported no pain and increased range of motion. The author states the primary symptom of piriformis syndrome is buttock pain with or without posterior thigh pain, aggravated by sitting or activity.

16 Beaty RA.

The piriformis muscle syndrome:

A simple diagnostic maneuver.

Neurosurgery 1994; 34(3):512–514.

Beaty presents 3 cases of patients who experienced increased pain while turning over in bed. 1: A 55-year-old man whose right sided buttock pain started at age 21 and who experienced severe pain while turning over in bed. 2: A 16-year-old boy, who sustained injury to his left buttock following a fall. His pain was aggravated by sitting and turning over in bed. This patient was treated with anti-inflammatory medications. 3: A 62-year-old woman who fell on a ski slope bruising her right buttock. Two years later during bed rest for a subarachnoid hemorrhage she experienced sciatica while turning over in bed. The author diagnosed piriformis syndrome using Freiberg’s maneuver, Pace’s maneuver, and a new technique he describes as “buttock pain reproduced when the patient turns over in bed.”

COMMENTARIES

17 Retzlaff EW, Berry AH, Haight AS, Parente PA, Lichty HA, Turner DM, Yezbick AA, Lapcevic JS, Nowland DJ. The piriformis muscle syndrome.

J Am Osteopathic Assoc 1974; 73:799–807.

The authors present an anatomical basis and physiologic reason for the presenting symptoms and several methods of treating piriformis syndrome. The symptoms are believed to be the result of contractures in the piriformis muscle with an increase in the diameter which presses on the nerves and vessels as they pass through the greater sciatic foramen. The authors mention the “piriformis sign” which is external rotation of the involved leg with the patient in the prone position. They also described a unique sign, deepening of the sulcus (because of the sacrum moving anterior) with a rotoscoliosis and increased lordosis. They explain females may have painful intercourse and males may experience impotence because the pudendal blood vessel supply is compressed by the contracture in the piriformis muscle. The authors write that the primary focus in treating piriformis syndrome should be to relieve the contracture.

18 Berry AH, Retzlaff EW. Reciprocal innervation of the Piriformis Muscle.

J Am Osteopathic Assoc 1978; 77(6):477.

The author writes about his method of treatment, using Sherrington’s law of reciprocal innervation (i.e. when a muscle is contracted, its homologue muscle will relax). By contraction of the gluteus medius and minimus on the contralateral side, the piriformis muscle on the opposite side will relax.

19 Kirkaldy-Willis WH, Hill RJ. A more precise diagnosis for low-back pain. Spine 1979; 4(2):102–109.

Kirkaldy-Willis and Hill discuss five common syndromes of low back and leg pain. The five syndromes are: 1) Nerve entrapment, 2) Posterior facet syndrome, 3) Sacroiliac and piriformis syndromes, 4) Herniation of the nucleus pulposus, and 5) Central spine stenosis. The authors describe how to do an intra-rectal examination and injection into the piriformis muscle with lidocaine and marcaine.

20 Simons DG, Travell JG. Low back pain-Part 3. Postgraduate Medicine 1983; 73(2):99–104.

This article was the third of a three part series furnishing detailed information on the diagnosis and treatment of myofascial pain. The third part addressed the piriformis muscle. Simons’ and Travell’s work is considered as “gold standard” in the diagnosis and treatment of trigger points. Simons and Travell discuss how to identify a trigger point, the referring pattern for each muscle, and treatment for trigger points. Their treatment protocol includes spray and stretch, hot packs, digital compression, and active range of motion.

21 Fligg DB. Piriformis technique. J Can Chiropr Assoc 1986; 30(2):87–88.

The author discusses the treatment of primary (acute) and secondary (chronic) piriformis involvement. Fligg demonstrates 3 techniques. The first technique is with the patient in a lateral recumbent position where either direct or indirect pressure can be applied. In the second figure the patient is prone with his knee flexed and externally rotated. This is a shortening technique, without stretching the muscle and indirect pressure application for treating acute piriformis syndrome. In the third figure for chronic piriformis syndrome, the patient is prone with knee flexed and internally rotated (to stretch the muscle) and direct or indirect pressure techniques applied. The author also suggests that ice, heat, and interferential current may be used.

22 Steiner C, Stubs C, Ganon M, Buhlinger C. Piriformis syndrome: Pathogenesis, diagnosis, and treatment. J Am Osteopath Assoc 1987; 87(4):318–323.

Steiner et al. thoroughly described the microanatomy and anatomy of the piriformis muscle and sciatic nerve. They differentiate sciatic neuritis from sciatic radiculitis stating that the most important criterion in the diagnosis of piriformis syndrome is the lack of “true” neurologic deficit, and that the only reliable positive sign is point tenderness of the piriformis muscle. The authors found that a combination of osteopathic manipulation, ethyl chloride spray and lidocaine injected into the piriformis muscle, stretching the piriformis muscle, and patient instruction on an exercise program were successful. They concluded that if

piriformis syndrome is overlooked, disc surgery may lead to “failed disc syndrome.”

- 23 Mondell DL, Garrison SJ, Geiringer SR, Anderson JM. Rehabilitation of musculoskeletal and soft tissue disorders. # 4 Pelvis and Lower Extremity. Arch Phys Med Rehabil 1988; 69:130–138.**

The authors present a self-directed learning module that details the presentation and treatment of many pelvis and lower extremity disorders, including piriformis syndrome. Piriformis syndrome is described as localized mid-buttock pain with or without radiation to the leg and usually no back pain. The authors state that palpation of the piriformis muscle causes local and sometimes radiating pain, and that reproduction of symptoms can be produced by resisted contraction or stretching of the piriformis muscle. The authors state that treatment should be directed at reducing the local spasm or irritation.

- 24 Wing T. The Piriformis Syndrome: Differential diagnosis in sciatica pain. How full-time metering aids therapy. The Digest of Chiropractic Economics 1988; 132–140.**

The author provides great detail on the anatomy of the pelvis, offers some common differential diagnoses, and gives treatment options for piriformis syndrome. The first treatment, called “MENS”, uses EMR interferential current (My-O-Matic I) with specific parameters and electrode placement. The author recommends using acupuncture with electric current in some cases.

- 25 Rich SE, McKeag D. When Sciatica is not disk disease. Detecting Piriformis Syndrome in active patients. Physician Sports Med 1992; 20(10):105–115.**

The authors create tables for diagnosing piriformis syndrome. They also write about the treatment for piriformis syndrome. After sciatic pain caused by herniated lumbar disk involvement has been ruled out the authors believe piriformis syndrome is then a diagnosis of exclusion. The first of three tables lists the possible etiologies of piriformis syndrome; the second table lists the clinical features of piriformis syndrome, and table 3 charts the typical findings that differentiate piriformis syndrome from discogenic disease. The main treatment for piriformis syndrome is stretching, ultrasound, and massage. Heel lifts and muscle injections may be prescribed as necessary according to the author.

QUASI EXPERIMENT

- 26 Fishman LM, Zybert PA. Electrophysiologic evidence of piriformis syndrome. Archive Physical Medicine Rehabilitation 1992; 73:359–364.**

This is a report of a study to investigate the use of H-reflex to aid in the diagnosis of piriformis syndrome. The subjects were drawn from outpatients referred to the department of physical medicine and rehabilitation. They tested the H-reflexes on 39 legs of the 34 piriformis cases, 13 unaffected contralateral limbs, and in 14 able-bodied subjects. The affected legs of the piriformis group had longer mean delay than the control groups ($p < 0.001$). The authors concluded that “electrophysiologic studies suggest that piriformis syndrome is a mechanical, functional impingement, and H-reflex provides a simple, non-invasive aid in the differential diagnosis of piriformis syndrome.”