Piriformis muscle syndrome. Diagnosis andtreatment. Presentation of 14 cases

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Purpose. The purpose of this study is to review the state of the art on the piriformis muscle syndrome, its diagnosis and therapeutic options since it is a relatively usual condition that often goes undiagnosed.
Materials and methods. A prospective study was performed of 14 cases, treated between January 2002 and December 2004. Patients were managed on the basis of a series of pre-established criteria and a previously-agreed on therapeutic protocol.
Results. During follow-up 100% of cases showed an improvement. With physical therapy 64% of patients improved (9/14), with the remainder requiring a more aggressive kind of treatment with corticoid/ozone infiltrations. One patient was treated with magnetotherapy. Decompressive surgery was not necessary.
Conclusions. Piriformis muscle syndrome can be diagnosed on the basis of a careful anamnesis and a thorough physical examination. The majority of patients respond to conservative treatment or to infiltrations, with surgery being necessary only on rare occasions.

Key words: *pyramidal muscle syndrome, piriformis muscle syndrome.*

Síndrome del músculo piramidal. Diagnóstico y tratamiento. Presentación de 14 casos

Objetivo. El objetivo de este trabajo es hacer una revisión sobre el síndrome del músculo piramidal, su diagnóstico y sus opciones terapéuticas, pues se trata de una patología infradiagnosticada aunque relativamente frecuente.
Material y método. Se realizó un estudio prospectivo de 14 casos, tratados entre enero de 2002 y diciembre de 2004, basándonos en una serie de criterios diagnósticos preestablecidos y tratados según una pauta terapéutica consensuada previamente.
Resultados. Durante el seguimiento de los pacientes se obtuvo una mejoría del 100% de los casos. Con terapia física mejoró el 64% (9/14) y el resto requirió un tratamiento más agresivo con infiltraciones de corticoides/ozono; un paciente fue tratado con magnetoterapia. No fue necesario realizar cirugía descompresiva.
Conclusiones. El síndrome del músculo piramidal puede ser diagnosticado con una correcta anamnesis y una completa exploración física. La mayoría de los pacientes responde al tratamiento conservador o a las infiltraciones, siendo raras las ocasiones en que es necesario recurrir a la cirugía.

Palabra clave: *síndrome del músculo piramidal, síndrome del músculo piriforme.*

INTRODUCTION

The «piriformis muscle syndrome» can be defined as the group of signs and symptoms caused by compression of the sciatic nerve as it leaves the pelvis through a canal located between the piriformis muscle and the gemellus superior muscle.

The piriformis muscle is a flat muscle that has its origin on the pelvic aspect of the sacrum between the second and fourth sacral foramina and has a long insertion long tendon attached to the upper border of the greater trochanter.

It is innervated by a branch of the major sciatic nerve, and divides into two parts before exiting the greater sciatic foramina, forming two small foramina: the infrapiriformis foramen, through which pass the major sciatic nerve, the inferior gluteal blood vessels, the minor sciatic

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Received: January 2007.
Accepted: May 2007.

Table 1. Detail of the clinical characteristics and evolution of the first four cases

Case No	1	2	3	4
Gender	Female	Female	Female	Male
Age	45	30	55	55
Side	Right	Left	Right	Left
Occupation	Farmer	Farmer	Home-maker	Sales
Main symptom	Gluteus & trochanter pain when standing	Sciatica	Lumbar sciatica Intolerant to sitting	Gluteal pain after prolonged driving
Clinical signs	Pain on pressing piriformis muscle Positive Freiberg sign Negative Lasegue	Pain on pressing piriformis muscle Positive Lasegue	Pain on pressing piriformis muscle Negative Lasegue	Pain on pressing piriformis muscle Positive Pace sign
Complementary tests	Negative X-rays	Negative X-rays Negative spinal NMR	Negative X-rays Positive spinal NMR	Negative X-rays
Initial VAS	7	7	8	4
Treatment 1.º	Post-isometric stretching, TENS & ultrasound (15 sessions)	Post-isometric stretching, TENS & ultrasound (15 sessions)	Post-isometric stretching, TENS & ultrasound (15 sessions)	Post-isometric stretching, TENS & ultrasound (15 sessions)
Recurrence/failure	Yes	No	No	No
Treatment 2.º	Post-isometric stretching, TENS & ultrasound (15 sessions)			
Recurrence	No			
Final VAS	1	0	1	0
Remarks				

VAS: visual analog scale; NMR: nuclear magnetic resonance; TENS: transcutaneous electrical nerve stimulation.

nerve, the internal pudendal blood vessels and the internal pudendal nerve; and the suprapiriformis foramen, through which pass the superior gluteal vessels and the superior gluteal nerve. Although 6 kinds of anatomical variations have been described related to the sciatic nerve and the piriformis muscle, in more than 80% of cases only a single nerve can be seen that passes below the pisiformis[1].

After the first descriptions carried out by Yeoman in 1928[2,3] in which the relationship between sciatica and sacroiliac pathological conditions was analyzed, the first description of piriformis muscle syndrome as such was carried out by Robinson en 1947. Since that time, its diagnosis, treatment, natural history and etiopathogenic evolution have been a subject of controversy, even to the point of sometimes casting doubt on its very existence[4,5].

Filler et al found that piriformis muscle syndrome was responsible for more than 65% of cases of chronic non-disc lumbosciatica and some authors considered it responsible for 5% of all cases of lumbosciatica[6].

Therefore it is surprising to see in the literature what little attention this syndrome has received.

The aim of this work is to draw attention to piriformis muscle syndrome which is, undoubtedly underdiagnosed and make its diagnosis and treatment options known to readers, based on our personal experience with 14 cases.

MATERIALS AND METHODS

Between January 2002 and December 2004, 14 cases of piriformis muscle syndrome were diagnosed and treated in the Orthopedic Surgery and Rehabilitation Department of the Alto Guadalquivir Hospital in Andujar and the Clínica Parque de San Antonio in Málaga.

Due to the lack of strict diagnostic criteria to define the syndrome, all the cases included in this series have been confirmed independently as such (main diagnosis) by consultation between a specialist in Rehabilitation and another specialist in Orthopedic Surgery.

The guidelines for treatment, agreed in January 2002, have always been the same:

1) Fifteen sessions of post-isometric stretching, transcutaneous electrical nerve stimulation (TENS) and ultrasound.

2) Steroid infiltrations up to a maximum of 3 or, if available, ozone infiltrations (3 cases).

3) Surgery to decompress (not used in any of the cases).

The patients treated with steroid infiltrations received 12 mg of betametasone as phosphate and acetate (Celestone Chronodose®), together with an ampoule of 10 ml of 1% mepivacaine injected into the most painful area. Ozone infiltrations were performed under fluoroscopic control with the help of a neurostimulator.

The puncture was made 2 cm to lateral and 1 cm to caudal of the lower edge of the sacroiliac joint. Initially half an ampoule of 1% mepivacaine was injected followed by 10 ml of ozone at a concentration of 30 Ìg, when a motor response was obtained. The last clinical control was performed 6 months after the application of the last treatment.

RESULTS

There were 10 women in this series (71.4%) and 4 men (28.5%). Mean age of the patients was 45.5 years (standard deviation [SD] 4.9). Half of them (50%) were in their thirties and forties. The right side was affected in 8 cases (57.1%) and the most frequent occupation of the patients was farmer in 42.8% of cases (6/14).

The most frequent symptom seen in the series was pain in the gluteal region, seen in 57% of cases (8/14) followed by lumbar pain, lumbosciatica or sciatica seen in 42.8% (6/14). Poor tolerance to sitting was seen in 7 cases (50%); in the other cases the clinical condition was not affected by position or worsened on standing or when an effort was made. The basic clinical sign found in 100% of cases, and that we considered of key importance to diagnose the condition, was the presence of pain on application of pressure in the area of the piriformis muscle. Pain on pressure was seen in 100% of cases and no other specific positive signs were seen (Pace or Freiberg sign) in absence of a positive reaction to pain. The sign of Lasegue was only positive in two patients in which sciatica was the main symptom.

In this series of patients diagnosis was clinical, in 1 case electromyography (EMG) was performed and was negative and in other cases nuclear magnetic resonance (NMR) served to rule out other conditions or diagnose secondary concomitant conditions. In 2 cases hip NMRs were performed that did not show changes in the piriformis muscle or the sciatic nerve.

Table 2. Detail of the clinical characteristics and evolution of the first four cases

Case No	5	6	7	8
Gender	Male	Female	Female	Female
Age	64	56	29	26
Side	Right	Right	Right	Left
Occupation	Retired farmer	Home-maker	Seamstress	Clerk
Main symptom	Buttock pain Intolerant to sitting	Low-back pain Occasional sciatica	Lumbar sciatica Gluteus & trochanter	Gluteal pain lumbosciatica Low-back pain that worsens when sitting
Secondary symptom	Subjected to right THR and TKR 1.5 cm LLD corrected with a lift		Pain at onset gait cycle	L5 paresis
Clinical signs	Pain on pressing piriformis muscle	Pain on pressing piriformis muscle Negative Lasegue	Pain on pressing sciatic nerve exit site	Pain on pressing piriformis muscle Positive Pace sign Negative Lasegue
Complementary tests	Negative X-rays	Negative EMG NMR: L4-L5 discopathy	Negative X-rays	Hip NMR: negative Spine NMR: 5th disc disrupted
Initial VAS	6	7	5	6
Treatment 1	Post-isometric stretching, TENS & ultrasound (15 sessions)	Post-isometric stretching, TENS & ultrasound (15 sessions)	Post-isometric stretching, TENS & ultrasound (15 sessions)	Post-isometric stretching, TENS & ultrasound (15 sessions)
Recurrence/failure	Yes	No	No	Yes
Treatment 2	3 celestone chronodose			Post-isometric infiltrations stretching, TENS & ultrasound (15 sessions)
Recurrence	No			No
Final VAS	2	2	1	1
Remarks		Presence of low back pain of discopathic origin together with the pirifoirmis syndrome		Persistence of mechanical low-back treated with a corset

LLD: leg length discrepancy; EMG: electromyography; VAS: visual analog scale; THR: total hip replacement; TKR: total knee replacement; NMR: nuclear magnetic resonance; TENS: transcutaneous electrical nerve stimulation.

Treatment by means of fifteen to 30 physical therapy sessions based on muscle stretching, TENS and ultrasound was effective in 64.2% of cases (9/14). The other cases required more aggressive treatment. Steroid infiltration was used in 2 cases, and failed in one. Ozone infiltrations were successful in the 3 cases in which they were used. Finally, one patient rejected infiltration and was treated successfully with magnetotherapy in another health center.

At 6 months after end-of-treatment only 37.7% (5/14) of the patients had a score of pain of 0 on the visual analogue scale (VAS), in the remainder some sort of discomfort persisted, although minor. Three patients who report pain of 2/10 on the VAS scale do not require further treatment.

DISCUSSION

The absence of an agreement on a definitive diagnosis of this syndrome causes bias when analyzing its epidemiology, and vastly differing data is found in the literature[7]. There are authors who consider its frequency is 5%[6] in patients with lumbar or sciatic pain who come to see a general practitioner and others report that current prevalence of this syndrome is 0.5 to 1% in patients with these symptoms that are referred to an orthopedic specialist and much less in patients who are seen by a general practitioner[8]. According to the literature this syndrome is seen more frequently in the third and fourth decade of life[9]; this data coincides with what we have seen in our series in which 50% of the patients were in these age groups. The female/male ratio in the series is 2.5/1, very similar to that found by Lang[4] (2004) in his series of 20 cases, in which it was 3/1.

Benson et al[10], in 1999, considered that this syndrome was caused by direct trauma to the gluteal region that causes hematoma and scarring surrounding the sciatic nerve and the rotator muscles. Klein[7] states that 50% of patients affected by this syndrome have a history of trauma, direct contusion of the gluteal region or forced hip and lumbar torsion; however, in the remaining cases the symptoms are of spontaneous appearance. In our series none of the patients reported a history of trauma, but there were 3 patients with occupations that entailed activities that could cause prolonged pressure on the gluteal region: a businessman, a seamstress and an office worker.

Table 3. Detail of the clinical characteristics and evolution of the first four case

Case No	9	10	11	12
Gender	Female	Male	Female	Female
Age	45	49	44	35
Side	Left	Left	Left	Right
Occupation	Home maker	Mechanic	Teacher	Garbage collector
Main symptom	Lumbar sciatica	Buttock pain Intolerance to sitting	Sacroiliac & buttock pain Intolerance to sitting	Lumbar pain irradiated to lower limbs Intolerance to prolonged sitting or standing
Secondary symptoms	3.5/5% loss of strength in hip abductors and external rotators	Low-back pain Pain irradiated to lower limbs		Diffuse paresthesia in posterior thigh
Clinical signs	Positive Lasegue Pain on pressing piriformis muscle	Pain on pressing piriformis muscle Positive Freiberg sign	Pain on pressing piriformis muscle	Pain on pressing piriformis muscle Positive Freiber sign
Complementary tests	Negative hip & spine NMRs	X-ray & NMR: lumbar arthritis & fibrous dysplasia of left femur	Negative X-rays	Negative X-rays &
Initial VAS	8	5	5	5
Treatment 1	Post-isometric stretching, TENS & ultrasound (15 sessions)	Post-isometric stretching, TENS & ultrasound (15 sessions)	Post-isometric stretching, TENS & ultrasound (15 sessions)	Post-isometric stretching, TENS & ultrasound (15 sessions)
Recurrence/failure	Yes	Yes	Yes	Yes
Treatment 2	Ozone therapy (4 sessions)	Ozone therapy (3 sessions)	Ozone therapy (3 sessions)	Post-isometric stretching, TENS & ultrasound (15 sessions)
Recurrence	No	No	No	No
Final VAS	0	1	0	0
Remarks		The main symptom is the same as that of other pathologies		Rejected infiltrations

VAS: visual analog scale; NMR: nuclear magnetic resonance; TENS: transcutaneous electrical nerve stimulation.

Table 4. Detail of the clinical characteristics and evolution of the first four cases

Case No	13	14
Gender	Female	Male
Age	39	66
Side	Right	Left
Occupation	Nursing assistant	Retired farmer
Main symptom	Mechanical buttock pain Intolerance to standing, at night sitting and lumbar strain	Buttock pain that intensifies
Secondary symptoms	Dysesthesia in posterior thigh	Doubtful sciatica
Clinical signs	Local pain on palpation of gluteuse Negative Lasegue Other signs were doubtful	Pain on pressing piriformis muscle Negative Lasegue Positive Freiberg sign
Complementary tests	Negative X-rays Negative hip & spine NMR	Negative X-rays
Pre-treatment VAS	6	5
Treatment 1	Post-isometric stretching, TENS & ultrasound (15 sessions)	Post-isometric stretching, TENS & ultrasound (15 sessions)
Recurrence	Yes	No
Treatment 2	3 celestone chronodose infiltrations	
Recurrence	Sí	
Final VAS	6	2
Remarks	Patient improved thanks to magnetotherapy administered in another center. Final VAS: 0	

VAS: visual analog scale; NMR: nuclear magnetic resonance; TENS: transcutaneous electrical nerve stimulation.

It was not necessary to operate on any of the patients in our series, so we cannot present surgical findings.

In 2003 Nakamura et al presented 2 operated cases[11]; in the first case, the sciatic nerve was divided into peroneal and tibial fascicles in the piriformis region, which was also divided into two parts, the inferior of which was a tendon. The peroneal portion of the sciatic passed over this and was compressed with the leg in a position of internal rotation.

In the second case the inferior portion of the piriformis muscle was very fibrous and compressed the nerve. In both cases resection of the fibrous area resolved symptoms.

In 1999 Benson et al[10] described preoperative findings in 14 patients (15 hips). One patient had ossifying myositis of the piriformis muscle, another patient had a branch of the sciatic nerve that passed through the piriformis muscle, 9 of the other 13 cases had a muscle that was more fibrotic than expected and in all 15 cases the sciatic nerve was attached to the posterior column of the pelvis.

The possible causes of this syndrome can be summarized in this manner:

1) Lumbar hyperlordosis, lower limb dissymmetry (LLD) and other biomechanical alterations.

2) Hypertrophy of the piriformis muscle, post-trauma fibrosis, regional anatomical abnormalities, total hip replacement (1 case in this series), occupations that involve long periods of time in a sitting position (3 cases in this series), ossifying myositis and intense physical activity: marathon runners, long distance walkers, etc.

The diagnosis of piriformis muscle syndrome is basically clinical, since the use of available complementary methods of exploration does not usually provide findings, although cases with positive EMGs and NMRs have been described[2]. However, complementary methods of exploration are of use in ruling out other pathological conditions that head the list of differential diagnosis in some patients with sciatic pain that affects the lower limbs or pain in the lumbar or trochanteric regions.

In many cases piriformis muscle syndrome may present as simulating a radiculopathy at L5 or S1 level due to a disc condition or facet syndrome with foramen narrowing and in many cases these conditions may appear simultaneously[2] (which was the case in 4 of the 14 cases of this series).

In 1947, Robinson established 6 elements on which to base the diagnosis of piriformis syndrome.

1) History of trauma in the gluteal or iliosacral region.

2) Presence of pain in the sacroiliac region, in the sciatic notch or along the length of the piriformis muscle that can irradiate to the lower limb and affect locomotion.

3) Exacerbation of pain symptoms when there is flexion of the spine or on carrying weights.

4) Palpation of a painful mass on the piriformis.

5) Positive Lasegue.

6) Atrophy of the gluteal muscles.

Classically several useful clinical signs are described to diagnose this syndrome based on passive muscle elongation or its contraction against resistance.

1) Freiberg maneuver: there is pain in the buttocks when there is forced internal rotation of the hip with the limb in extension.

2) Pace maneuver: Abduction against resistance of the affected hip, with the patient sitting, generates pain.

3) Beatty maneuver: this maneuver causes pain in the gluteal region due to selective contraction of the piriformis muscle.

The patient is placed on their healthy side with their hip in flexion and abduction of the affected muscle is performed; the position is maintained some seconds, this causes pain[5].

Subsequently, other authors[12] have established other diagnostic criteria for this syndrome:

1) Pressure on the piriformis muscle causes sciatica.

2) Rectal palpation of the lateral pelvis wall causes pain.

3) Freiberg and Pace signs are positive.

4) There is contraction on external rotation of the affected limb, to which may be added relief of pain when local anesthetic infiltrations into the piriformis muscle are performed. Complementary exploration of the positive region with H reflex measurement with EMG is recommended.

The classical (Freiberg, Pace and Beatty) signs maneuvers are not difficult to perform but occasionally can be difficult to interpret, and can become positive or negative in subsequent exams, and in many cases have doubtful results. On the other hand, intolerance to a prolonged sitting position may have important diagnostic value when comparing this syndrome to other conditions that improve in a sitting position such as narrowing of the lumbar spine canal or facet syndrome.

Although diagnosis of this syndrome is clinical, some recent articles[1] highlight the value of a diagnostic EMG, computerized axial tomography (CAT) or NMR. EMG may detect myopathic and neuropathic changes, including more than 3 SD in H reflex, during flexion, adduction and internal rotation of the hip. On the other hand, CAT and NMR may show widening of the piriformis muscle or its atrophy and substitution by fibrous tissue[2,13].

In 2003, Nakamura et al[11] recommended the use of dynamic evoked potentials using an epidural electrode inserted at L3/4 and stimulating the peroneal nerve at the head of the fibula.

The following conditions must be ruled out during differential diagnosis:

1) Ischiogluteal bursitis: There is referred pain in the buttocks region which increases with lower limb extension against resistance. There is pain to pressure over the ischial tuberosity. This condition is frequent in individuals who remain seated for long periods [12]. Usually there are no signs seen on X-ray, but occasionally calcifications can be seen near the ischial tuberosity.

2) Trochanteric bursitis: there is referred pain on the lateral side of the hip that can irradiate to the lower limb simulating sciatica. The patient is hypersensitive to pressure on the trochanter. Passive abduction and adduction, as also abduction against resistance, are painful.

3) Hamstring syndrome: patients report pain on the posterior aspect of the thigh from the ischial tuberosity to the popliteal fossa, both in a sitting position and climbing inclines or stairs. This pain increases with knee flexion against resistance. The hamstrings are contracted[14].

4) Pain from the sacroiliac joint: the patients report selective pain located in the mid-gluteal region (patients report pricking sensation). Negative Lasegue. Pelvis aperture and closure maneuver is positive, with pain in that region.

5) Radiculopathies: patients report lumbar pain that irradiates throughout the territory of the affected root, with a decrease of sensitivity and reflexes according to the root affected.

Management of this syndrome must begin with physical therapy and simultaneous administration of non steroid anti-inflammatory drugs (NSAIDs), painkillers, re-education of patients to eliminate negative habits and correction of biomechanical alterations if these exist.

Together with physical therapy techniques, muscle stretching[15], local massage, ultrasound [16] and TENS achieve improvement of pain in a high percentage of cases.

As was stated by Parziale et al[6], in 1996, and as can be seen in the series we have presented, these conservative treatments are sufficient in most cases, but when they are not, more aggressive techniques must be applied such as infiltrations or surgery.

Mullin et al[17] (1998) recommended treatment by means of intradural infiltrations of steroids.

Lang[4] (2004) reported that 95% pain relief was obtained in 20 patients treated with type B Botulin toxin.

When the abovementioned treatments fail surgery must be considered and will consist, in general, in a section of the piriformis muscle with neurolysis of the sciatic nerve. Although in this series we do not present any operated case, the results reported in the literature are satisfactory[1,13], and rapid symptom relief is achieved.

In conclusion, an adequate anamnesis and clinical exam may strongly suggest the presence of piriformis muscle syndrome. Usually this syndrome responds to conservative treatment, NSAIDs, physical therapy and infiltrations. If these treatments fail, the literature seems to indicate that good results may be obtained by means of surgical decompression of the sciatic nerve.

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Conflict of interests

The authors have declared that they do not have any conflict of interests.