

## Ruling out Piriformis Syndrome before Diagnosing Lumbar Radiculopathy

Chi-Chien Niu, MD; Po-Liang Lai, MD; Tsai-Sheng Fu, MD; Lih-Huei Chen, MD;  
Wen-Jer Chen, MD, PhD

**Background:** Piriformis syndrome (PS), a rare cause of sciatica, is usually diagnosed only after excluding all other possibilities. But this principle is being challenged because of the number of patients with PS who have had ineffective lumbar decompressive surgery after positive findings on image study.

**Methods:** From 2001 to 2004, twelve patients with piriformis syndrome diagnosed by physical examination were retrospectively enrolled in this study. Indicators of piriformis syndrome include a positive Freiberg sign and local tenderness over the piriformis tendon. All patients received local injection of triamcinolone acetonide and lidocaine into the piriformis tendon. The course of diagnosis and treatment was reviewed retrospectively from patient records and patient recollections.

**Results:** Of seven (58.3%) patients who had positive findings on computed tomography (CT) or magnetic resonance imaging (MRI) studies of the lumbar spine, four had previously undergone unsuccessful lumbar surgeries but were responsive to local injection and three received the injection first. Two of those three required no lumbar discectomy thereafter. However, one patient subsequently underwent lumbar decompression surgery because of failed response to the local injection. Three patients had negative CT or MRI findings, and two received no CT or MRI study. According to our diagnostic flowchart for PS, further lumbar surgery was unnecessary for eleven of the twelve patients at follow-up.

**Conclusions:** According to experience in this series, a Freiberg test and local injection should be performed first to rule out PS in patients with unilateral sciatica. If symptoms are relieved by local injection and further physical therapy for PS, unnecessary lumbar surgery can be avoided.

*(Chang Gung Med J 2009;32:182-7)*

**Key words:** piriformis syndrome, lumbar radiculopathy, sciatica, Friberg test

Piriformis syndrome (PS) is an under-diagnosed cause of buttock and leg pain, possibly because it is thought to be a rare cause of sciatica,<sup>(1)</sup> and there

are no conclusive diagnostic tests. The medical literature consistently emphasizes exclusion of other causes of sciatic pain before diagnosing PS.<sup>(2,3)</sup>

---

From the Department of Orthopedic Surgery, Chang Gung Memorial Hospital, Taipei, Chang Gung University College of Medicine, Taoyuan, Taiwan.

Received: Jan. 31, 2008; Accepted: Apr. 21, 2008

Correspondence to: Dr. Chi-Chien Niu, Department of Orthopedic Surgery, Chang Gung Memorial Hospital, No. 5, Fusing St., Gueishan Township, Taoyuan County 333, Taiwan (R.O.C.) Tel.: 886-3-3281200 ext. 2163; Fax: 886-3-3278113; E-mail: niuchien@cgmh.org.tw

A herniated intervertebral disc (HIVD) of the lumbar spine is the most common cause of sciatic nerve pain. Other less common causes include lumbar stenosis, intraspinal lesions and pelvic lesions in patients with significant sciatic pain and positive root tension signs. Root tension signs include the Lasègue sign (maneuver following hip flexion with the knee extended and foot dorsiflexed produces pain around the greater sciatic notch) and the positive straight leg raising test (SLRT - creating radicular pain below 70 degrees of elevation from the supine position). A definite diagnosis of HIVD tends to be made according to consistent pathology (both level and laterality) in the lumbar spine noted on computed tomography (CT) or magnetic resonance imaging (MRI), and surgical intervention may be required if conservative treatment fails.

Formerly, piriformis syndrome was considered if CT or MRI findings were negative or did not correspond to the clinical symptoms. Using this principle, if a patient with PS has positive findings on lumbar CT or MRI study, he might have surgery under the impression of lumbar radiculopathy.

However, the standard diagnostic flowchart for sciatica is questionable in treating PS according to the clinical experience of this team. Several patients in this study had persistent sciatica despite lumbar decompression surgery for lumbar disc herniation or stenosis, and PS was subsequently confirmed by a positive response to a local piriformis injection. This study presents the clinical experience of this team in treating PS and examines current deficiencies in the treatment protocol for sciatica.

## METHODS

From 2001 to 2004, twelve patients diagnosed with piriformis syndrome were retrospectively enrolled. The syndrome was diagnosed by both the symptoms and specific signs. The symptoms were pain over the buttocks area radiating downward to the posterior thigh or the leg along the course of the sciatic nerve. The signs include tenderness over the piriformis tendon from the piriformis fossa to the edge of the greater sciatic notch, a positive Freiberg sign (pain on forced internal rotation of the extended thigh),<sup>(4)</sup> and a positive combined flexion-adduction-internal rotation (FADIR) test of the affected hip.<sup>(5)</sup> Based on these diagnostic criteria, these patients

received a local injection of 1 ml triamcinolone acetonide with 1 ml 1% lidocaine.

Pathological conditions of the sacral, sacroiliac and hip joint areas had been primarily evaluated and excluded by physical examination and radiograms. Image studies, including MRI or CT scan, of the lumbar spine were performed in ten patients. Due to conflicting reports<sup>(6,7)</sup> regarding its use for diagnosing PS, MRI of the hip area was not a diagnostic criterion for PS and was not done routinely in this series.

In all patients, the clinical course of PS syndrome before the diagnosis was recorded by reviewing the MRI or CT scan and was also based on the recollection of the patients. The response to treatment, including local injection, medication and physical therapy after diagnosis of PS, was also recorded by retrospectively reviewing patient medical records and by telephone interviews with the patients.

Clinical outcome at follow-up was evaluated according to Odom criteria:<sup>(8)</sup> excellent, no hip or leg pain, no limitation of activity, no required medication; good, pain improved with minimal medication, mild restriction of activity; fair, pain improved but with frequent medication, moderate restriction of activity; poor, no improvement or even worse pain. The severity of pain was evaluated by a visual analog scale (VAS) before and after treatment.

## RESULTS

In this study, twelve patients diagnosed with piriformis syndrome were analyzed. The diagnosis of PS was confirmed in eleven of the twelve patients diagnosed with PS in this study, based on positive response to combined local injection of a steroid and lidocaine at the point of tenderness, and no further surgery was required. One patient experienced no improvement after local injection but improved after decompressive surgery of the lumbar spine as proven by MRI findings.

The table displays patient data and clinical information for all subjects. Four patients had received lumbar spine decompressive surgery due to positive CT or MRI findings before the diagnosis of PS. However, the symptoms persisted despite surgery. PS was then diagnosed by Freiberg and FADIR tests, and symptoms substantially improved after local injection (Fig. 1). Another three patients with positive CT or MRI study were initially treated

**Table 1.** Demographic Data, Results of Physical and Imaging Examinations and Clinical Course of Patients in this Study

Patient	Sex	Age	L-spine CT or MRI	Previous L-surgery	SLRT	Freiberg's Test	FADIR Test	Tender Point	VAS Pre-inj	VAS Post-inj	Response to inj	Clinical Outcome	Late Op for L-spine
1	W	41	R't L4-5 HIVD	R't L4-5 discectomy	50	P	P	S*	8	4	1.5 m	G	nil
2	M	53	L't L4-5 HIVD	L't L4-5 discectomy	80	P	P	S	8	5	2 m	G	nil
3	M	26	L't L5-S1 HIVD	L't L5-S1 discectomy	60	P	P	S	9	4	9 m	G	nil
4	W	41	R't L5-S1 HIVD+DDD	R't L5-S1 discectomy	70	N	P	T†	8	6	3 m	F	nil
5	M	27	negative	nil	60	P	P	S	9	3	5 y	E	nil
6	W	25	negative	nil	60	N	P	S	8	6	1 m	G	nil
7	W	62	negative	nil	90	P	P	S	8	4	2 y	G	nil
8	M	68	L't L4-S1 stenosis	nil	90	P	P	S	8	3	4 y	E	nil
9	W	42	L't L5-S1 HIVD	nil	70	P	P	S	9	4	4 y	E	nil
10	M	48	R't L4-5 HIVD	nil	50	N	P	S	8	8	no response	P	yes
11	W	45	nil	nil	50	P	P	S	9	3	5 y	E	nil
12	M	55	nil	nil	80	P	P	S	8	5	2 m	G	nil

**Abbreviations:** W: Woman; M: Male; P: Positive; N: Negative; E: Excellent; G: Good; F: Fair; P: Poor. \*: tender point at sacral end of piriformis muscle; †: tender point at trochanteric end of piriformis muscle.

for PS. Two had good improvement after injection and further conservative treatment but one failed to improve. Three patients with negative lumbar CT or MRI findings and another two without lumbar CT or MRI study were also successfully treated for PS by

injection.

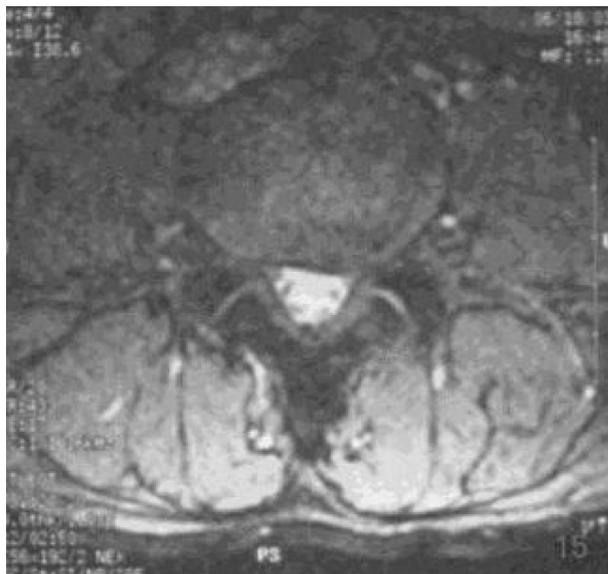
After treatment, clinical outcomes according to the diagnostic flowchart in this series were excellent in four cases, good in six cases, fair in one case and poor in one case. The overall satisfaction rate was 83.3%. The VAS score improved from  $8.3 \pm 0.5$  before treatment to  $4.6 \pm 1.5$  after treatment.

## DISCUSSION

The piriformis muscle originates from the sacrum, ilium and capsule of the sacroiliac joint, passes through the greater sciatic foramen, and is attached to the superior border of the greater trochanter. It functions as an external rotator and an abductor of the hip joint when the thigh is extended and flexed separately.<sup>(9)</sup> The muscle is anatomically related to the sciatic nerve,<sup>(10)</sup> so sciatica is commonly associated with PS.

Piriformis syndrome is widely believed to result primarily from entrapment of the sciatic nerve by inflammation and swelling of the piriformis muscle.<sup>(1,11)</sup> Common complaints include gluteal pain radiating down the leg along the course of the sciatic nerve.<sup>(12)</sup> Symptoms are always confined to the affected side.<sup>(1)</sup> Discomfort caused by acute exacerbation may cause difficulty walking.

Physical examination may reveal distinct ten-



**Fig. 1.** A fifty-three-year-old man with persistent left sciatica did not respond to a left L4-5 discectomy. Preoperative MRI study showed disc protrusion on the left side of the left L4-5 disc in the axial view on T2W images.

derness and reproduction of pain by digital pressure over the belly of the piriformis muscle in the gluteal region, mostly induced at the medial end of the belly on the lateral margin of pelvis.<sup>(13)</sup> Pain induced by forced internal rotation of the extended thigh is considered a positive Freiberg sign.<sup>(4)</sup> This maneuver tightens the piriformis and exerts pressure on the sciatic nerve. Combined FADIR of the affected hip may also present in PS patients.<sup>(11)</sup> A positive Lasègue sign and SLRT are also common presentations in PS patients; these two signs are specific for HIVD of the lumbar spine. Abnormal neurologic function presenting as motor weakness is rare. Local anesthetics and cortisone may be injected into the piriformis muscle to relieve pain upon diagnosing PS.<sup>(11,13,14)</sup> The dramatic and almost immediate relief of pain produced by infiltration of the piriformis muscle with local anesthetic is considered to be a diagnostic aid for PS.

CT and MRI are reportedly valuable for diagnosing PS by revealing enlargement of the piriformis muscle;<sup>(6)</sup> however, adequate sensitivity remains questionable.<sup>(7)</sup> The role of electrodiagnostic tests, another potential tool for objectively diagnosing PS, has also been investigated with mixed and equivocal results.<sup>(15)</sup> The superior method of diagnosing this disease has not been defined. Therefore, PS was diagnosed in this series based on clinical symptoms, specific physical examinations and positive response to local injection. Because adequately sensitive, specific and objective diagnostic tests for PS are currently unavailable, and since lumbar radiculopathy is occurred more frequently than PS in clinical practice, a diagnosis of PS is usually made only after excluding lumbar spine pathologies.<sup>(2,3)</sup>

The experiences of our four patients who had lumbar decompression surgery after positive image findings challenge the validity of the above flowchart for a differential diagnosis of sciatica (diagnosis of lumbar spine lesion before PS). Nevertheless, seven of the twelve patients had positive findings on lumbar CT or MRI study. Only one patient had an actual lumbar spine problem.

Eight of the twelve patients had positive SLRTs on physical examination. A herniated intervertebral disc of the lumbar spine was easily impressed by this sign and additional severe symptoms (sciatica-like radiating pain unilaterally). Thus, three of the four patients with previous ineffective lumbar surgery had strong positive SLRTs. The pathophysiology of PS

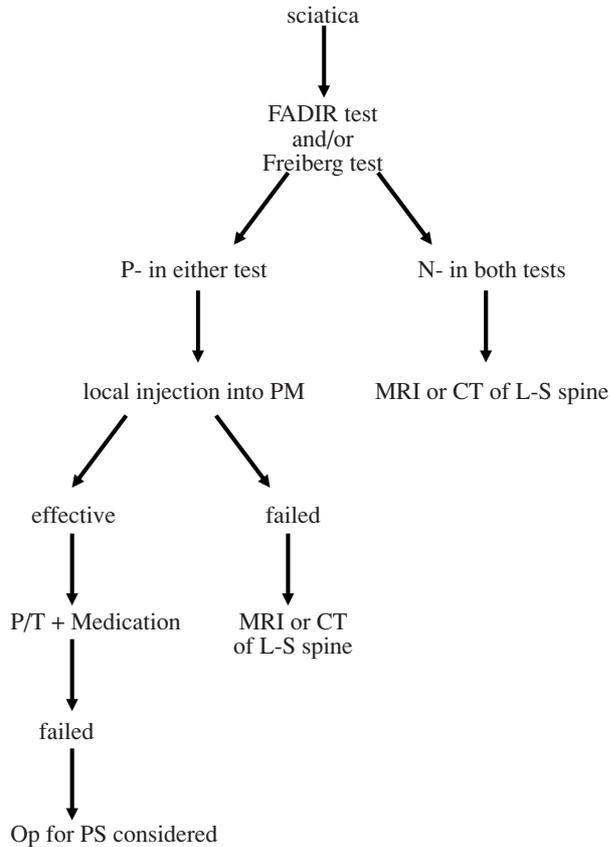
(overlying inflammation and swollen piriformis tendon compressing the sciatic nerve) explains the positive SLRTs. In the differential diagnosis of sciatica, local injection with combined steroid and xylocaine to exclude PS is much less invasive than surgery to confirm lumbar spine pathology. Therefore, a reasonable standard procedure in patients with acute sciatica-like symptoms or a positive SLRT is to first rule out PS with Freiberg and FADIR tests and then performing a local piriformis tendon injection if necessary.

In the present study, 10 PS patients experienced satisfactory results one had fair clinical results after conservative management with nonsteroidal medication or physical therapy, or both. None of these PS patients needed operative treatment. The indications for surgery for PS are failed improvement after a prolonged period of conservative treatment and consistent diagnostic tests for PS. Surgery consists of release of the piriformis tendon and sciatic neurolysis.<sup>(16)</sup>

According to the experience of this team in treating PS in this series, use of the originally recommended flowchart (ruling out the more common causes such as lumbar stenosis or HIVD first, and considering PS afterward) for differentially diagnosing patients with sciatica-like symptoms may result in misdiagnosis and unsuccessful lumbar surgery. In a revised flowchart (Fig. 2) PS is first excluded by meticulous physical examination using the Freiberg and FADIR tests or even local steroid/ anesthetic injection regardless of the CT or MRI lumbar spine results. This strategy can easily exclude PS, is minimally invasive and can be performed on an outpatient basis. If Freiberg and FADIR tests rule out PS, or if there is a negative response to local injection in patients with positive Freiberg and FADIR tests, investigation for a lumbar spine lesion can proceed. CT or MRI can be done to evaluate possible HIVD or stenosis.

Using this flowchart, PS was ruled out in only one of the twelve patients in this study, but that patient still received appropriate treatment after the failed local injection. Compared to failed lumbar surgery, the discomfort from an injection into this tendon can be considered acceptable.

One observed shortcoming of this retrospective study is that the incidence data may not be representative due to the small patient number. The conclu-



**Fig. 2** Flowchart depicting a diagnostic approach to patients with unilateral sciatica-like symptoms.

sions of this study should therefore be interpreted cautiously until further analysis with a larger patient population can be done.

## REFERENCES

1. Robinson DR. Piriformis syndrome in relation to sciatic pain. *Am J Surg* 1974;3:355-8.
2. Rodrigue T, Hardy RW. Diagnosis and treatment of piriformis syndrome. *Neurosurg Clin N Am* 2001;12:311-9.
3. Vandertop WP, Bosma NJ. The piriformis syndrome, a case report. *J Bone Joint Surg Am* 1991;73:1095-7.
4. Freiberg AH, Vinkle TH. Sciatica and the sacro-iliac joint. *J Bone Joint Surg* 1934;16:126-36.
5. Papadopoulos EC, Khan SN. Piriformis syndrome and low back pain: a new classification and review of the literature. *Orthop Clin N Am* 2004;35:65-71.
6. Jankiewicz JJ, Hennrikus WL, Houkom JA. The appearance of the piriformis muscle syndrome in computed tomography and magnetic resonance imaging. *Clin Orthop Relat Res* 1991;262:205-9.
7. Lee EY, Margherita AJ, Gierada DS, Narra VR. MRI of piriformis syndrome - case report. *AJR Am J Roentgenol* 2004;183:63-4.
8. Odom GL, Finney W, Woodhall B. Cervical disk lesions. *JAMA* 1958;166:23-8.
9. Brown JA, Braun MA, Namey TC. Piriformis syndrome in a 10-year-old boy as a complication of operation with the patient in a sitting position. *Neurosurgery* 1988;23:117-9.
10. Beaton LE, Anson BJ. The sciatic nerve and the piriformis muscle: their interrelation a possible cause of coccygodynia. *J Bone Joint Surg* 1938;20:686-8.
11. Solheim LF, Siewers P, Paus B. The piriformis muscle syndrome - Sciatic nerve entrapment treated with section of the piriformis muscle. *Acta Ortop Scand* 1981;52:73-5.
12. Durrani Z, Winnie AP. Piriformis muscle syndrome: an underdiagnosed cause of sciatica. *J Pain Symptom Manage* 1991;6:374-9.
13. Pace JB, Nagle D. Piriformis syndrome. *West J Med* 1976;124:435-9.
14. Hanania M, Kitain E. Perisciatic injection of steroid for the treatment of sciatica due to piriformis syndrome. *Reg Anesth Pain Med* 1998;23:223-8.
15. Nakamura H, Seki M, Konishi S, Yamano Y, Takaoka K. Piriformis syndrome diagnosed by cauda equina action potentials. *Spine* 2003;28:E37-40.
16. Benson ER, Schutzer SF. Posttraumatic piriformis syndrome: diagnosis and results of operative treatment. *J Bone Joint Surg Am* 1999;81:941-9.

## 先排除犁狀肌症候群再診斷腰椎因性傳導神經病變

牛自健 賴伯亮 傅再生 陳力輝 陳文哲

**背景：**犁狀肌症候群是造成坐骨神經痛的較鮮見原因。故通常是排除其他常見原因之後才診斷之。但根據此原則，臨床上卻發現有病人依據影像檢查先被誤診為腰椎神經壓迫而接受腰椎減壓手術，但無解決病痛的情形。

**方法：**自 2001 年至 2004 年期間，12 位病人依據理學檢查 Freiberg 試驗陽性結果診斷為犁狀肌症候群，所有病人皆接受了局部犁狀肌注射治療。同時依據病歷與病人記憶，收集了病人曾接受的檢查與治療的記錄。

**結果：**7 位病人有腰椎電腦斷層或核磁共振的陽性發現，其中即有 4 位曾經接受了腰椎減壓手術，但症狀無改善才再被診斷為犁狀肌症候群而接受局部注射治療，另外 3 位即先被診斷為犁狀肌症狀群而接受局部注射治療；2 位有效，但另 1 位局部肌腱注射無效才接受了腰椎手術，且症狀確有改善。另外 3 位腰椎電腦斷層或核磁共振檢查為陰性結果，與 2 位無接受上述腰椎檢查。12 位病人中有 11 位病人由理學檢查診斷為犁狀肌症候群後給予局部肌腱注射治療得到改善，且之後亦無須再接受腰椎手術的必要。

**結論：**根據此回溯性的臨床經驗，對單側坐骨神經痛的病人應先由 Freiberg 試驗與局部肌腱注射排除是否為犁狀肌症候群，若確實可經由局部注射而症狀改善，即使有陽性腰椎檢查結果，亦不須接受不必要的腰椎手術。  
(長庚醫誌 2009;32:182-7)

**關鍵詞：**犁狀肌症候群，腰椎傳導神經病變，坐骨神經痛，Freiberg 試驗

---

長庚紀念醫院 台北院區 骨科部；長庚大學 醫學院

受文日期：民國97年1月31日；接受刊載：民國97年4月21日

通訊作者：牛自健醫師，長庚紀念醫院 骨科。桃園縣33龜山鄉復興街5號。Tel.: (03) 3281200轉2163; Fax: (03)3278113;

E-mail: niuchien@cgmh.org.tw