

# Extraspinal Bone and Soft-Tissue Tumors as a Cause of Sciatica

## Clinical Diagnosis and Recommendations: Analysis of 32 Cases

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**Study Design.** Between 1982 and 1997, the authors treated 32 patients with sciatica who subsequently were found to have a tumor along the extraspinal course of the sciatic nerve.

**Summary of Background Data.** Extraspinal compression of the sciatic nerve by a tumor is a rare cause of sciatica. Signs and symptoms overlap those of the more common causes of sciatica (*i.e.*, herniated disc and spinal stenosis).

**Objective.** To characterize the unique clinical presentation of these patients and to formulate guidelines that may lead to early diagnosis.

**Methods.** All pertinent clinical data and studies were reviewed retrospectively, and standard demographic data were collected for analysis.

**Results.** These patients typically sought treatment for an insidious onset of sciatic pain that was constant, progressive, and unresponsive to change in position or bed rest. The mean time to final diagnosis was 11.9 months (median, 6 months). Seventeen patients were able to locate their pain to a specific point along the extraspinal course of the sciatic pain, and a mass was noted in 13 patients. Eighteen of these tumors were in the pelvis, 10 in the thigh, and 4 in the popliteal fossa and calf.

**Conclusions.** A high index of clinical suspicion is the key to early diagnosis of bone or soft-tissue tumors as a cause of sciatica; special attention should be given to pain pattern, physical examination of the entire course of the sciatic nerve, and selection of proper imaging studies. Routine anteroposterior plain radiography of the pelvis as part of the initial imaging screening process is recommended. [Key words: compression, extraspinal, sciatica, sciatic nerve, tumors] **Spine 1999;24:1611-1616**

The sciatic nerve arises from the L4, L5, S1, S2, and S3 nerve roots and passes out of the pelvis through the greater sciatic foramen down the back of the thigh to its lower third, where it divides into the tibial and common peroneal nerves. Sciatica is defined as pain along the course of the sciatic nerve or its branches and most commonly is caused by herniated disc or spinal

stenosis. Characteristically, patients report gluteal pain radiating down the posterior thigh and leg, paresthesia in the calf or foot, and varying degrees of motor weakness. Extraspinal entrapment of the sciatic nerve (*i.e.*, along its course within the pelvis or the lower extremity) is infrequent and difficult to diagnose because its symptoms are similar to those of the more frequent causes of sciatica.<sup>8,10,14</sup> Sciatic nerve compression has been reported secondary to heterotopic ossification around the hip,<sup>17</sup> misplaced intramuscular injections, myofascial bands in the distal thigh,<sup>1,15</sup> and myositis ossificans of the biceps femoris muscle.<sup>5</sup> Additional causes include post-traumatic or anticoagulant-induced extraneural hematomas<sup>11,20</sup> and compartment syndrome of the posterior thigh.<sup>21</sup> Entrapment sciatic neuropathy complicating total hip arthroplasty has been described secondary to escaped cement, subfascial hematoma, and nerve impingement during trochanteric wiring.<sup>4,7</sup>

Individual case reports of bone and soft-tissue tumors along the course of the sciatic nerve have been described as a rare cause of sciatica.<sup>2,3,6,9,12,13,16,19</sup> The early diagnosis of a tumor as the underlying pathology is crucial because early resection, in addition to producing symptomatic relief and preventing further neurologic damage and unnecessary spine surgeries, may have an impact on patients' survival. Odell and Key<sup>8</sup> reported on 19 patients with a malignant bone tumor in the lumbar spine or the pelvis, 10 of whom had symptoms of degenerative disc disease. Laminectomy was performed unnecessarily in 9 of these patients. Twenty-two years later, Sim et al<sup>14</sup> published their series of 38 patients with bone tumors of the lumbar spine, pelvis, and lower extremity that simulated herniated disc. Although only 7 of these lesions were confined to the lumbar spine, 24 patients underwent laminectomy.

Between 1982 and 1997, the authors of the current report treated 32 patients with sciatica who subsequently were found to have either a bone or soft-tissue tumor along the extraspinal course of the sciatic nerve. After an analysis of these data was performed, it was possible to characterize the typical pain pattern of that subgroup of patients and to formulate guidelines that may lead to early diagnosis of an underlying neoplastic process as the cause of sciatica.

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**Table 1. Criteria for the Use of Imaging Studies in the Evaluation of Patients With Sciatica, Suspected of Having an Extraspinal Cause**

Imaging Study	Indication
Plain radiography, lumbar spine, AP + lateral views	All patients
Plain radiography, pelvis, AP view	All patients
Plain radiography, lower extremity	Suspected bone lesion, lower extremity
CT scan, pelvis	Suspected bone lesion, pelvis
CT scan, lower extremity	Bone lesion on plain radiography
MRI, pelvis	Suspected soft tissue lesion, pelvis
MRI, lower extremity	Suspected soft tissue lesion, lower extremity
Total body bone scan	History of malignancy

### Materials and Methods

A retrospective analysis of the authors' surgical database between 1982 and 1997 allowed for the identification of 32 patients who had been treated for pain along the course of the sciatic nerve and whose sciatica had been diagnosed clinically. All pertinent clinical data and studies for these patients were reviewed. Standard demographic data were collected for analysis.

Patients were referred for treatment after having pain for an average period of 11.9 months (range, 1–59 months) and after undergoing multiple imaging studies. There were 18 female and 14 male patients, with ages ranging from 14 to 76 years (average age, 46.7 years). Plain radiography, yielding anteroposterior and lateral views of the lumbar spine and upper sacrum, had been performed in all 32 patients, computed tomography in 13, magnetic resonance imaging in 15, and bone scan in 4. Four patients had undergone spine surgery with no resolution of their symptoms.

Evaluation in the orthopedic oncology outpatient clinic included medical history with an emphasis on the pain pattern and an effort to detect an underlying malignancy or neurofibromatosis. Physical examination included complete neurologic evaluation, straight leg raising test, and meticulous evaluation of the entire palpable course of the sciatic nerve from the sciatic notch to the foot. After physical examination, the set of imaging studies was completed according to the following criteria, which are summarized in Table 1. Final diagnosis was achieved by needle biopsy or open incisional or excisional biopsy in all patients.

### Results

At the initial examination, all patients reported pain at least 1 month in duration that was unrelated to trauma. All patients described an insidious onset of pain. Although some patients initially had only intermittent pain, all developed pain that was constant, progressive, and unresponsive to change in position or bed rest. Twenty-five patients described significant night pain. Of the 7 patients with a history of tumor, 4 had an underlying malignancy, and 3 had neurofibromatosis. Conservative treatment brought only a temporary improvement or no improvement at all. Straight leg raising was positive in 29

patients, 17 of whom were able to locate the pain to a specific point along the palpable course of the sciatic nerve, distal to the sciatic notch. Three patients had a history of a mass along the sciatic nerve, and physical examination revealed a mass in an additional 10 patients. The detailed medical history, combined with a physical examination, enabled the authors to determine the location of the lesion (pelvis, thigh, or calf) and suggested its nature (*i.e.*, soft-tissue or bone lesion) in 22 patients.

Plain radiographs of the pelvis, taken in the anteroposterior plane, revealed 13 of 17 bone lesions. Of the remaining 4 lesions, 2 were located in the pelvis and were detected with a computed tomography scan, and the other two, located in the midfemur and proximal fibula, were detected with plain radiographs of those sites. Magnetic resonance imaging of the pelvis or lower extremity revealed all suspected soft-tissue lesions.

There were 18 tumors around the pelvis, 10 in the thigh, and 4 in the popliteal fossa and calf (Figure 1). Of the 32 tumors found, 17 were confined to bone (Figures 2–6), and 15 to soft tissues (Figures 7 and 8). Eighteen

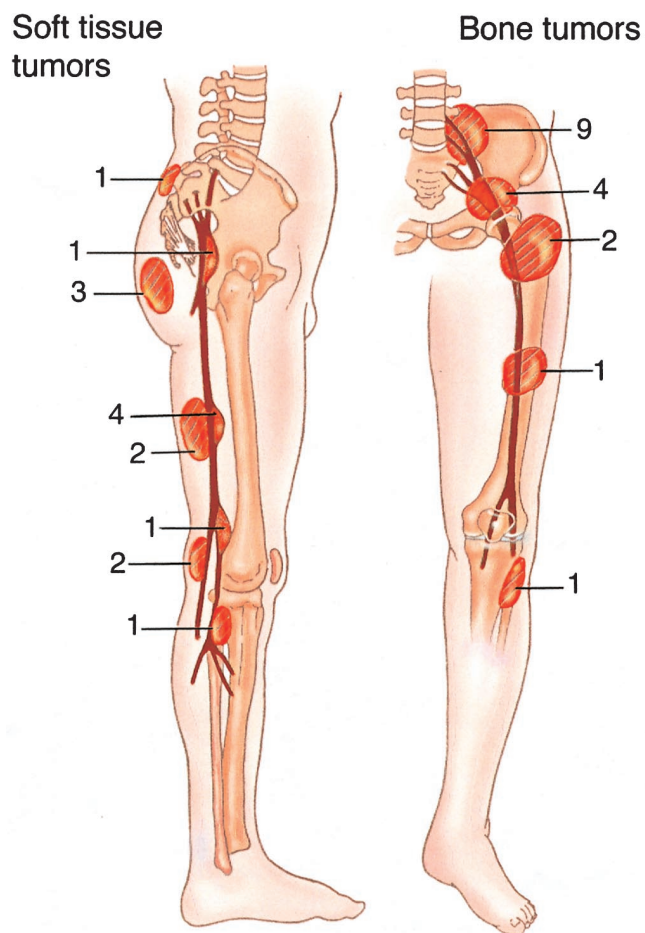


Figure 1. Anatomic distribution of bone and soft-tissue lesions along the course of the sciatic nerve.



Figure 2. Retroperitoneal amyloid pressing against the intrapelvic course of the sciatic nerve.

tumors were malignant (6 metastatic lesions, 5 primary bone sarcomas, and 7 soft-tissue sarcomas, 2 of which were malignant tumors of the sciatic nerve). Of the 14 benign tumors, 4 originated from the sciatic nerve. The tumor sites, histopathologic diagnosis, and clinical data of the 32 patients are summarized in Table 2.

■ Discussion

Despite the wide variation in histologic diagnosis and anatomic location of these tumors, all 32 patients had a similar and specific pain pattern. The pain pattern, which is caused by direct compression of the nerve by a growing mass, is the single most characteristic finding in these patients. The inherent doubling time and local aggressiveness of the tumor determine the severity of symptoms as well as the rate of deterioration.

Seven patients had a history of an underlying disease (cancer, neurofibromatosis) that led the surgeon to search for a tumor as the source of sciatica. In the remaining 25 patients, the pain pattern was the only

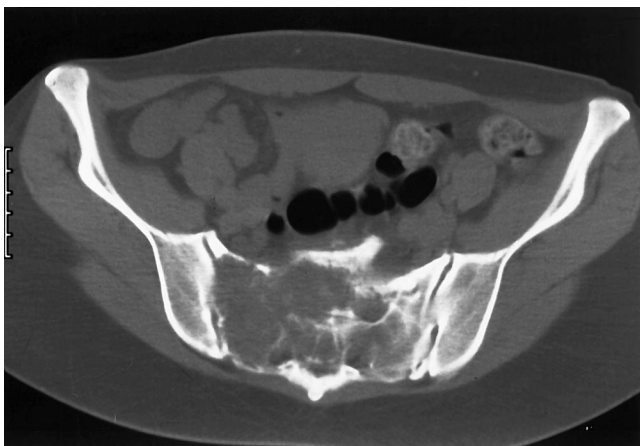


Figure 3. Giant cell tumor of the sacrum in a patient with low back pain, posterior thigh pain, and S1 radiculopathy.



Figure 4. Chondrosarcoma of the periacetabular region and inferior pubic ramus. The patient had a 2-year history of groin and posterior thigh pain.

unique detail in the medical history. Patients with sciatic pain and a history of neurofibromatosis or of malignant disease that is prone to skeletal metastases (*e.g.*, prostate, breast, lung, kidney, and thyroid cancers) should be considered to have a spinal or extraspinal tumor until proven otherwise. The importance of an adequate and detailed medical history can not be underestimated.

Although the results of the straight leg raising test were positive in the majority of the patients, and the mere presence of a positive test was not indicative of an extraspinal tumor, more than half of the patients were able



Figure 5. Osteochondroma of the proximal femur, viewed by plain radiography.



Figure 6. Intraoperative view of the osteochondroma shown in Figure 5. The lesion (arrow) was found to be pressing against the sciatic nerve.

to locate the sciatic pain to a specific point along the extraspinal course of the sciatic nerve, distal to the sciatic notch. Combined with the fact that a mass was noted in 13 patients, history and physical examination allowed the diagnosis of a probable tumor as a cause of the sciatic pain in 22 patients. The ability of a patient to locate a sciatic pain to an extraspinal point should be considered an alarming sign.

The authors' review of imaging studies performed on these patients before they were referred to the authors' practice demonstrated that the screened-down nature of routine lumbar spine films is not adequate. This standard



Figure 7. T2-weighted magnetic resonance image of a high-grade soft-tissue sarcoma of the adductor and posterior compartments of the thigh. The patient had a 4-month history of posterior thigh and calf pain.

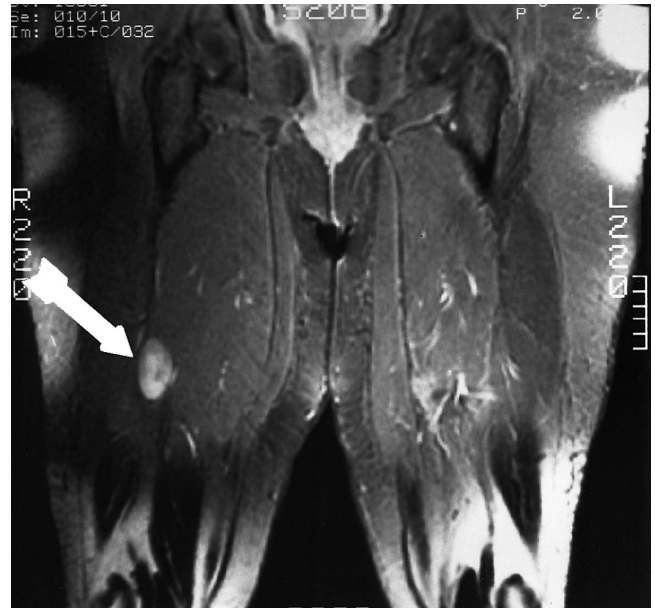


Figure 8. T2-weighted magnetic resonance image of a neurofibrosarcoma of the sciatic nerve (arrow) in a patient known to have neurofibromatosis. The patient had a 1-month history of posterior thigh and calf pain.

view does not extend far enough to the side to include the sacroiliac complex; therefore, bony tumors in that region may be overlooked. In addition, it is generally agreed that it is difficult to recognize early bone lesions of the pelvic ring, particularly the sacrum, because of the almost universal presence of overlying intestinal gas.<sup>10</sup> Retrospective evaluation of the first radiograph that included the entire pelvis showed a tumor in all patients in the series reported by Paulson<sup>10</sup> and by Thompson and Berg.<sup>18</sup> Because the majority of the bone tumors in the current series were found in the pelvis or proximal femur, the authors recommend the routine use of anteroposterior plain radiography as part of the initial imaging screening process of any patient with sciatic pain. Computed tomography is recommended when bone lesions are suspected around the pelvis; site-specific plain radiographs are used for bone lesions of the lower extremities when indicated by the physical examination. The current authors recommend magnetic resonance imaging for soft-tissue lesions along the entire course of the sciatic nerve in patients in whom extraspinal soft-tissue tumor is suspected.

The bone and soft-tissue tumors found in the current series represent a large spectrum of biologic behaviors and prognoses. Presenting detailed information on treatment modalities and oncologic outcome is beyond the scope of this article, which focuses on diagnosis. Nevertheless, an early diagnosis of any bone or soft-tissue tumor along the sciatic nerve will result in a less extensive surgery and, in selected cases, might improve patients' prognosis.

**Table 2. Clinical Presentation, Time to Diagnosis, Diagnosis, and Anatomic Location of 32 Bone and Soft Tissue Tumors Along the Course of the Sciatic Nerve**

Patient No.	Age (yr)	Sex	Clinical Presentation	Time to Diagnosis (mo), Diagnosis	Anatomic Location
1	F	42	Posterior thigh pain	(6) Neurofibroma	Sciatic n., distal thigh
2	F	63	Calf pain	(6) Neurofibroma	Common peroneal n., distal thigh
3	F	42	Posterior thigh pain, palpable mass known neurofibromatosis	(3) Neurofibroma	Sciatic n., mid-thigh
4	F	49	Posterior thigh and calf pain, palpable mass	(17) Schwannoma	Sciatic n. bifurcation
5	F	18	Posterior thigh and calf pain, known neurofibromatosis	(1) Neurofibrosarcoma	Sciatic n.
6	M	44	Low back pain, L5 radiculopathy, known neurofibromatosis	(32) Malignant peripheral nerve sheath tumor	Sciatic n., below the lumbosacral plexus
7	F	75	Hip and posterior thigh pain	(5) Myxoma	Gluteus maximus m.
8	F	34	Hip and posterior thigh pain	(59) Pigmented villonodular synovitis	Sciatic notch
9	F	62	Calf pain, palpable mass	(1) Lipoma	Lateral aspect of popliteal fossa
10	M	39	Posterior thigh and knee pain	(5) Liposarcoma	Mid-thigh
11	M	39	Calf numbness	(1) Liposarcoma	Popliteal space
12	F	68	Buttock pain	(24) Liposarcoma	Buttock
13	M	48	Calf pain	(3) Soft tissue sarcoma	Medial gastrocnemius
14	M	67	Posterior thigh and calf pain	(4) Soft tissue sarcoma	Mid-thigh
15	F	62	S1 radicular pain	(15) Amyloidosis	Sacrum-ilium
16	M	27	S1 radicular pain	(6) Osteochondroma	Sacrum
17	M	32	Hip and posterior thigh pain	(1) Fibrous dysplasia	Proximal femur
18	F	39	Posterior thigh pain	(13) Desmoplastic fibroma	Mid-femur
19	F	43	Low back and posterior thigh pain, S1 radiculopathy	(11) Giant cell tumor of bone	Sacrum
20	F	23	Low back and posterior thigh pain	(6) Tenosynovial giant cell tumor	Sacrum
21	F	14	Hip and posterior thigh pain	(4) Aneurysmal bone cyst	Sacrum
22	F	76	Buttock and posterior thigh pain	(14) Chondrosarcoma	Periacetabular region
23	M	35	Low back and hip pain	(54) Chondrosarcoma	Proximal femur
24	M	60	Groin and posterior thigh pain	(24) Chondrosarcoma	Acetabulum
25	F	19	Foot pain	(14) Chondrosarcoma	Proximal fibula
26	M	60	Low back and posterior thigh pain	(24) Chondrosarcoma	Periacetabular region
27	F	54	Hip and posterior thigh pain, history of breast cancer	(3) Metastatic breast cancer	Sacrum
28	M	54	Low back, posterior thigh pain, history of hypernephroma	(1) Metastatic hypernephroma	Sacrum
29	M	44	Posterior thigh pain	(13) Metastatic hypernephroma	Sacrum-ilium
30	M	45	Hip and posterior thigh pain, history of adenocarcinoma of colon	(4) Metastatic adenocarcinoma	Periacetabular region
31	F	63	Low back and posterior thigh pain, history of lung cancer	(1) Metastatic lung cancer	Sacrum
32	M	55	Low back and posterior thigh pain	(6) Metastatic hypernephroma	Sacrum

Sciatica may be caused by extraspinal bone and soft tissue tumors along the course of the sciatic nerve. The pain pattern is key to early diagnosis. Special attention should be given to patients with sciatica that had an insidious onset and is constant, progressive, and unresponsive to change in position. Medical history, physical examination, and the use of appropriate imaging studies can identify the site of the lesion and suggest its nature. Early detection of these unusual tumors may eliminate prolonged pain, minimize the number of unnecessary operative interventions of the spine, and may have an impact on patients' survival.

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