

Use of Single-Photon Emission Computed Tomography/Low-Resolution Computed Tomography Fusion Imaging in Detecting an Unusually Presenting Osteoid Osteoma of the Lumbar Vertebra

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Abstract

In this article, we describe an unusual presentation of osteoid osteoma of the lumbar vertebra in a woman in her early 30s. Single-photon emission computed tomography/low-resolution computed tomography (SPECT/CT) fusion imaging was used to detect the osteoma, precisely localize the pathology site, and guide surgical excision of the lesion. In recent years, SPECT/CT fusion imaging has helped make interpretations of scintigraphic images significantly more accurate.

Osteoid osteomas of the spine classically present with local pain, often worse at night, which typically responds to anti-inflammatory agents. Bone scintigraphy typically shows a localized area of increased tracer uptake with the central nidus showing intense uptake, and computed tomography (CT) usually confirms the diagnosis by revealing an osteolytic central nidus surrounded by a dense sclerotic area.

In this article, we report the case of a lumbar spine osteoid osteoma that was unusual in its presentation and lacked typical radiologic findings. Accurate localization of the lesion—accomplished with single-photon emission CT/low-resolution CT (SPECT/CT) fusion imaging—allowed for targeted surgery, which relieved the patient of her symptoms.

CASE REPORT

A woman in her early 30s presented with low back pain radiating to the left lower limb. She reported no worsening of symptoms at night and no significant relief from use of nonsteroidal anti-inflammatory drugs. Clinical examination was unremarkable except for tenderness over the

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left sacroiliac area. There were no root tension signs, and spinal range of motion was normal. Lumbosacral spine radiography was unremarkable (Figure 1). Magnetic resonance imaging (MRI) of the spine revealed no abnormality (Figure 2). Bone scintigraphy with technetium-99 methylene diphosphonate revealed a focal area of increased uptake in the left lateral aspect of the L5 vertebra (Figure 3). Fusion images, acquired with a SPECT/CT system (Infinia Hawkeye; GE Healthcare, Waukesha, WI), localized the lesion in the L5 facet (Figure 4).

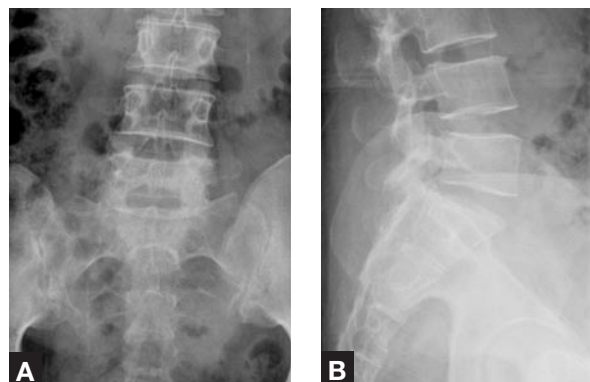


Figure 1. Anteroposterior (A) and lateral (B) plain radiographs of lumbosacral spine are unremarkable.

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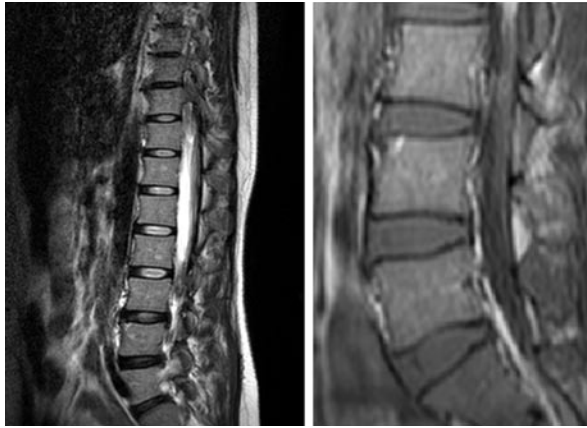


Figure 2. Magnetic resonance imaging does not reveal any abnormality. Posterior arch elements are normal.

A working diagnosis of facet arthropathy was made, and the patient was initially treated with analgesics and then with a local infiltration of a long-acting local anesthetic (bupivacaine 2%) and a steroid (methylprednisolone 40 mg). Her pain improved but returned within 4 weeks. Further investigation with CT demonstrated sclerotic changes in the left facet and hemilamina of the L5 vertebra, corresponding to the lesion demonstrated with SPECT/CT (Figure 5).

The patient underwent left hemilaminectomy of the L5 vertebra and a medial facetectomy. The excised bone was sent for histopathologic and bacteriologic examination. Cultures were negative. Histopathologic examination showed cartilage and an underlying lesion composed of an interlacing network of osteoid and woven bone trabeculae with prominent osteoblastic rimming and few scattered osteoclasts. The intertrabecular spaces contained vascularized fibrous connective tissue. Adjacent host lamellar bone trabeculae were thickened and sclerotic. The diagnosis was confirmed as osteoid osteoma (Figure 6). The patient reported significant reduction in symptom severity in the immediate postoperative period.

This case is unusual for 3 reasons. First, the patient presented with pain in the sacroiliac region, away from where the lesion was actually located, and lacked the

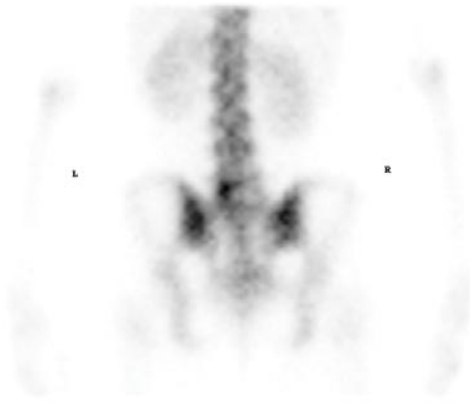


Figure 3. Bone scintigraphy planar image of L5 vertebra shows focal area of increased uptake in lateral aspect.

symptoms typical of osteoid osteoma. Second, the lesion, not evident on plain radiography and MRI, was clear on planar bone scintigraphy. Third, the lesion was detected on SPECT/CT fusion images, which were helpful in precisely localizing the pathology site and guiding surgical excision. The patient's symptoms improved remarkably.

DISCUSSION

Osteoid osteoma is a common benign osteoid-forming tumor of bone that occurs in the second or third decade of life.¹ Even though any bone may be affected, 50% to 60% of these lesions develop in the femur and the tibia, and 10% develop in the lumbar spine. Of the spinal osteomas, 59% occur in the lumbar spine, 27% in the cervical spine, 12% in the thoracic spine, and 2% in the sacrum.² Vertebral osteoid osteomas typically arise from posterior elements—the base of the transverse processes, laminae, and pedicles. The vertebral body is seldom involved.

The sensitivity of bone scintigraphy with SPECT, which allows 3-dimensional imaging, is usually superior to that of planar imaging.^{3,4} Detection and precise localization of the lesion, particularly in vertebrae, is useful in patients with facet joint disease, spondylolysis, arthritis, or complications of spinal fusion.^{5,6} In a study of 58 patients with low

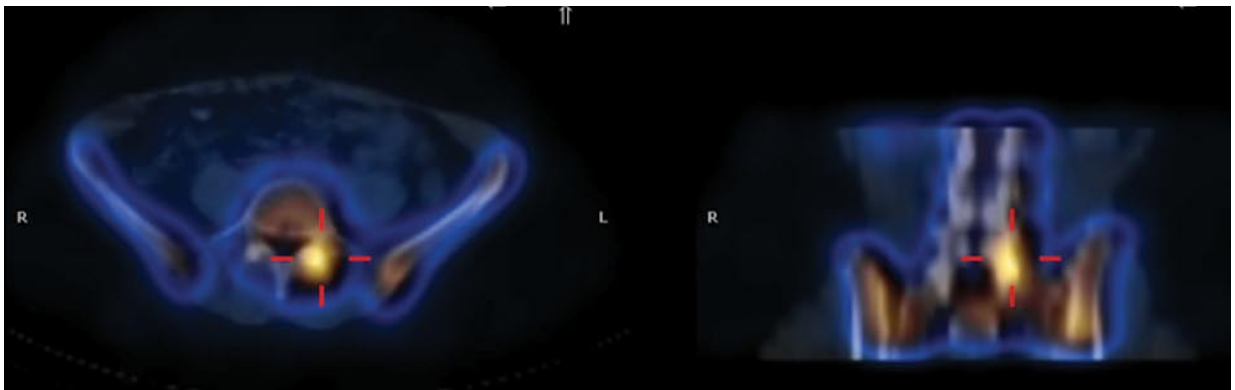


Figure 4. Single-photon emission computed tomography/low-resolution computed tomography fusion images show focal hot spot in L5 facet on left side.

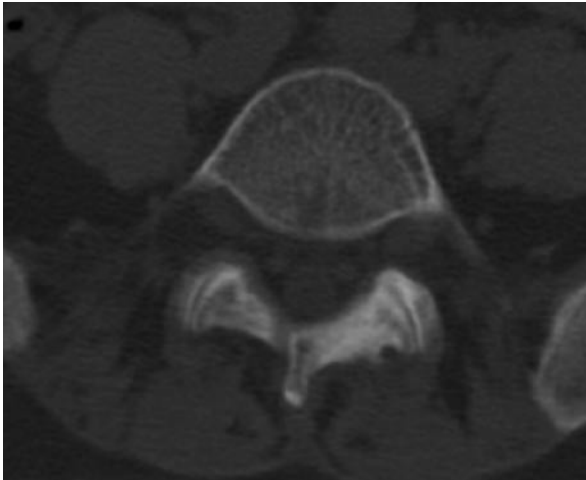


Figure 5. Computed tomography shows sclerosis in facet and hemilamina of L5 vertebra on left side.

back pain, SPECT identified facet joint activity and predicted a successful response to local anesthetic injections.⁷ In recent years, SPECT/CT fusion imaging has helped make interpretations of scintigraphic images significantly more accurate.⁸ MRI, sensitive in identifying arthritis of the lumbar facet joint, did not detect our patient's lesion. The lesion was more precisely localized on SPECT/CT fusion images versus SPECT alone.

Although high-resolution CT would have delineated the lesion well, the patient's symptoms were misleading with respect to the lesion site. Moreover, bone scintigraphy supplemented with SPECT/CT is more cost-effective than high-resolution CT and MRI.

To our knowledge, this is the first reported case of using SPECT/CT fusion imaging in detecting an unusually presenting osteoid osteoma of the lumbar vertebra missed on plain radiography and MRI.

AUTHORS' DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article.

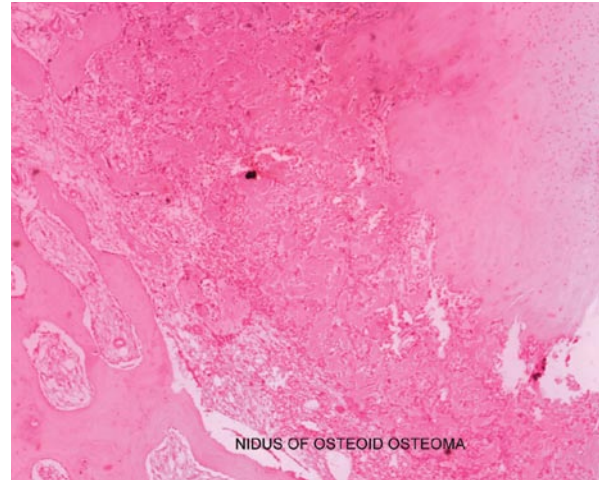


Figure 6. Histopathologic examination shows cartilage and underlying lesion composed of interlacing network of osteoid and woven bone trabeculae with prominent osteoblastic rimming and few scattered osteoclasts. Intertrabecular spaces contain vascularized fibrous connective tissue. Adjacent host lamellar bone trabeculae are thickened and sclerotic.

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