Technical Note

Conservative surgery for osteoid osteoma of the lumbar vertebrae

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Abstract

**Background:** We present two patients with osteoid osteomas of the lumbar spine to highlight the delay in diagnosis and the utility of precise radiological localization enabling tumor resection without jeopardizing spinal stability.

**Case Description:** Two young patients with refractory back pain presented after having undergone a year of conservative treatment for presumed mechanical back pain. The presence of “red-flag” symptoms (e.g. rest and night pain, and transient pain relief with aspirin) led to the performance of an isotope bone scan, and subsequent computed tomography (CT), which were both consistent with the diagnosis of an osteoid osteoma. After accurate CT-based preoperative planning for tumor excision, a customized conservative surgical technique was utilized that included marginal en-bloc surgical resection of the tumors. As the intervertebral facet joints were also carefully preserved along with stability, no accompanying instrumented fusion was warranted. Both patients returned to full function with complete resolution of their long-standing back pain of more than 2 years.

**Conclusions:** The diagnosis of osteoid osteoma of the spine requires a high index of clinical suspicion. Diagnostic evaluations should include thin-slice CT scan to assist in planning the most restricted/conservative en-bloc surgical resection while preserving vertebral stability with facet preservation, and thus avoiding instrumented fusions. Without the availability of percutaneous radiofrequency ablation, such restricted/conservative approaches to osteoid ostomas are viable options in countries with developing economies.

**Key Words:** Lumbar vertebrae, osteoid osteoma, spine, tumor resection

INTRODUCTION

Low back pain is the fifth most common reason for all physician visits in United States.¹ Most patients with back pain improve with supportive treatment (e.g. rest, postural precautions, nonsteroidal antiinflammatory medications (NSAIDS), muscle relaxants, and an exercise program), but an occasional (<1%) patient with a tumor or infection may not improve.⁶ Osteoid osteoma, a benign bone tumor characterized by a nidus of vascular osteoid tissue surrounded by a margin of dense sclerotic bone, accounts for 2.5-5% of all bone tumors, 10-14%
of which involve the spine. As these tumors are rare, and the symptoms (e.g. pain over the vertebral column, worse at night, relieved by aspirin/NSAIDS, and/or referred along the trunk/lower extremity) are easily misinterpreted as radicular; thus the correct tumor diagnosis may be delayed. Two patients with osteoid osteomas of the lumbar spine are presented to highlight the delay in diagnosis and to describe precise radiological localization afforded by computed tomography (CT), which enabled discrete tumor resection without jeopardizing spinal stability.

**CASE PRESENTATIONS**

**Case 1**
A 20-year-old male presented with localized low back pain of 2 years duration, attributed to lifting a heavy object. Pain was persistent, worse at night, unrelated to activity, but characteristically relieved promptly with NSAIDS. He was misdiagnosed for over a year, and prescribed physiotherapy, analgesic/antiinflammatory therapy, and tricyclic antidepressants without improvement. On presentation he exhibited mild scoliosis, negative straight-leg-raise test and no focal neurological deficit. Plain X-rays of lumbosacral spine were normal, but the radioisotope bone scan (Tc-99m) showed increased uptake in left posterior half of the L2 vertebra. The CT scan confirmed that the L2 lesion was sclerotic with a lucent focus in the left postero-inferior quadrant (Figure 1a). Surgery, performed in the right lateral decubitus position utilizing an anterior retroperitoneal approach to the L2/L3 intervertebral space (X-ray confirmed) allowed for en-bloc resection of the involved quadrant of the L2 vertebral body while preserving the end-plates and posterior vertebral border (Figure 1b). Reconstruction of the bony defect was accomplished by impacting custom-sized tricortical bone graft harvested from the iliac crest (Figure 1c); no additional fusion was required.

![Figure 1: (Case 1 and 2): Case 1 (a-d): preoperative images (a): axial CT image showing dense sclerotic ring (arrow) around a lucent nidus in the left posterior quadrant of the vertebral body of L2. (b): Preoperative planning: line drawings of proposed bone resection and reconstruction with bone graft. Postoperative axial CT images showing intact posterior cortex and bone graft (arrow) in situ (c) and fully incorporated at 12 months (d). Case 2 (e-h): Radioisotope bone scan posterior view (e) showing dense uptake in right side of L2 vertebra (arrow); AP X-ray (f) abnormal bony shadow over the right lamina of L2 vertebra (arrow); axial CT image (g) showing dense sclerosis around a nidus in the left lamina of L2. Postoperative AP X-ray (h) bone defect (arrow) in the left lamina of L2 vertebra at the site where tumor was resected using high-speed burr without violating the facet joint]
Postoperatively the patient was allowed to ambulate freely.

At 2-weeks postoperative follow-up the patient reported complete relief of his long-standing pain. At 12 postoperative weeks, the X-rays documented full incorporation of the bone graft [Figure 1d]. In his last follow-up at 9 years, he was completely pain-free and had full function of the spine.

**Case 2**

A 16-year-old male presented with persistent localized lower lumbar pain of 2 years duration. Pain was progressive, occurred at rest and at night, was relentless, was increased by walking, and immediately although transiently relieved with NSAIDS. He had been labeled neurotic and given antidepressants. On examination, he exhibited a mild postural scoliosis in the lumbar spine concave to the right, but had no focal neurological deficit and negative straight-leg-raise test. Radioisotope bone scan showed increased uptake over the right side of L2 vertebra on posterior view [Figure 1e] corresponding to X-ray showing a vague halo over the right neural arch of L2 [Figure 1f]. High resolution CT scan confirmed a dense nidus and circular halo involving the right lamina [Figure 1g]. Surgery, performed prone, consisted of removal of the right lamina utilizing a 3 mm high-speed burr. Careful preservation of the pars interarticularis, inferior articular process, and the facet joint [Figure 1h] avoided instability and the need for a fusion. The patient experienced a dramatic reduction in pain within one postoperative week. The patient was asymptomatic 5 years later. The histopathology confirmed an osteoid osteoma.

**DISCUSSION**

The challenges with spinal osteoid osteomas are twofold; (1) establishing the diagnosis, and then (2) management without compromising function. Of interest, both our patients had the classical findings of chronic back pain dramatically relieved with NSAIDS, and both remained undiagnosed for 2 years during which time they were thought to be suffering from depression. These findings were consistent with the literature, which cites an average delay of 10 months between the onset of symptoms and definitive diagnosis,[2] with many patients being labeled as psychotics or malingerers.

**“Red flags”**

Clinical “Red flags” that signal the presence of possible serious spinal pathology (including tumors such as osteoid osteoma), include constant progressive pain which does not get relieved with bed rest [Table 1][7] as was present in both our patients. In addition, the classical relief of pain with NSAIDS, and the focally positive bone scan strongly raise the suspicion of osteoid osteoma. For confirmation, thin slice CT is not only the best diagnostic tool, but also facilitates accurate tumor localization for planning resection.[2,4]

**Surgical management of osteoid osteomas:**

**Complete excision**

With osteoid osteomas, only complete surgical excision ensures the least risk of local recurrence, and effectively provides immediate pain relief and early mobilization. Newer, minimally invasive methods, including percutaneous CT-guided radiofrequency ablation (RFA), are gaining popularity internationally for the treatment of extra spinal tumors.[5] However, for intraspinal lesions in the neural arch, these procedures have potential for damage to neural structures (e.g. heat generation), and risk inaccurate localization, incomplete tumor ablation, and residual/recurrent tumor with continued symptoms. In our cases, in a developing country, accurate preoperative planning with thin-slice CT-scan, followed by precise surgical en-bloc resection and curettage resulted in complete excision and with full symptomatic relief, without tumor recurrence, respectively, 9 and 5 years postoperatively.

**Preserving function**

Thin-slice CT scan enables surgical planning of focal tumor resection, without resection of facet and intervertebral joints. This avoids compromise of vertebral stability and obviates the need for instrumented intervertebral fusion, which would otherwise have resulted in decrease of spinal motion. Both our patients had full spinal motion at final follow-up.

**CONCLUSION**

A high index of clinical suspicion is the key to diagnosing spinal osteoid osteomas. In developing countries, where
the newer technology and expertise for minimally invasive treatment may not be available, precise radiological localization using thin-slice CT scan can enable complete tumor excision without destabilization, and without symptom or tumor recurrence.

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