

Osteoid Osteomas of the Lumbar Spine: A Descriptive Study of the Diagnostic Imaging Features

Dr. Ravi Garg¹, Dr. Probin Joseph²

¹Post Graduate, Department of Radiodiagnosis, Navodaya Medical College Hospital & Research Centre, Raichur – 584103, Karnataka

²Post Graduate, Department of Orthopaedics, Indira Gandhi Govt. General Hospital and Post-Graduate Institute, Puducherry – 605001

Abstract: Osteoid osteoma is a benign bone tumor, accounting for approximately 12% of all benign skeletal neoplasms. It occurs most frequently in young male patients between first to third decades of life. The most common presenting symptom is pain, that worsens at night and is promptly relieved by the administration of salicylates. 10 to 20% of osteoid osteomas occur in the spine, most commonly involving the lumbar segments, with a predilection for the posterior elements. We present a descriptive study of 260 patients presenting with complaints of low backache, worsening at night, for more than 1 year duration. Osteoid osteomas localized to the lumbar spine were diagnosed in 12 patients. We report the various imaging manifestations of the tumor, with discussion of the diagnostic features on various imaging modalities.

Keywords: osteoid osteoma, vertebra, lumbar, computed tomography, magnetic resonance imaging

1. Introduction

Osteoid osteoma is a benign bone tumor, accounting for approximately 12% of all benign skeletal neoplasms.^[1] It occurs most frequently in young male patients between the first to third decades of life.^[2] The most common presenting symptom is pain, which characteristically worsens at night and is promptly relieved by the administration of salicylates.^[3] Histologically, it contains osteoblasts which produce osteoid & woven bone. They are mostly found in the long bones of extremities and posterior vertebral elements. 10 to 20% of osteoid osteomas occur in the spine,^[4] most commonly involving the lumbar segments, with a predilection for the posterior elements.^[5] They are characterized by the presence of an intracortical nidus with variable amount of calcification, along with cortical thickening, sclerosis, and bone marrow edema.^[6] Identification of the presence of nidus on radiological imaging forms the mainstay of diagnosis.^[7]

2. Material and Methods

All the patients referred to our department with complaints of low backache, worsening at night, for more than 1 year, with no complaints of fever and no history of any trauma, were included in the study. The patients were subjected to radiographs of the lumbar spine (antero-posterior & lateral views) along with CT and MRI evaluation of the lumbar spine. The study was conducted over a period of 10 months and 260 patients were included in the study. Radiographs of the lumbo-sacral spine were obtained as the initial imaging modality, with antero-posterior and lateral views. Non-enhanced CT scans were then obtained with three-reconstructions as per requirements. In cases with positive findings, MRI was performed with screening sagittal T2-weighted sequences of the whole spine. Multi-sectional T1W, T2W and STIR sequences were performed in the lumbo-sacral spine. Osteoid osteomas localized to the

lumbar spine were identified in 12 patients. These cases were tabulated and appropriate statistical analyses were performed.

3. Results

A total of 260 patients, between the ages of 10-40 years, presenting with complaints of lower backache of more than 1 year duration were included in the study. Osteoid osteomas localized to the lumbar spine were identified in 12 patients. Majority of the patients belonged to the age bracket of 20-30 years (Table 1), with most of the cases occurring in males (Table 2).

The most common presenting symptom of patients with osteoid osteoma of the lumbar spine was pain in the lower back, which was present in all the 12 cases. Additionally, varying degrees of scoliosis was identified in 8 patients. 3 patients had associated gait disturbances, while limb atrophy was not evident in any patient (Table 3).

Majority of osteoid osteomas were noted involving the L1 vertebra, followed by the L5 vertebra (Table 4). In 9 cases, the posterior vertebral elements were involved, with a predilection noted for the pedicle and the vertebral body (Table 5).

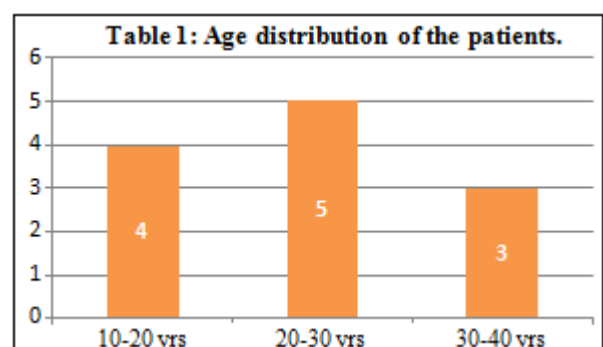


Table 2: Sex distribution of the patients.

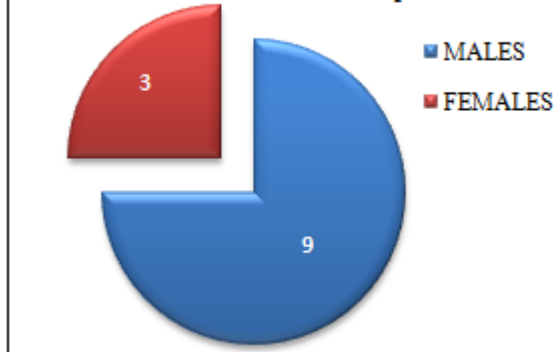


Table 3: Presenting complaints of the patients.

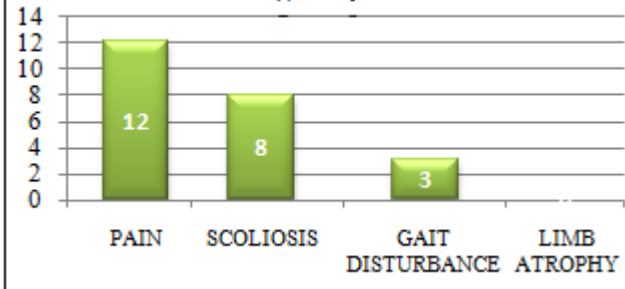
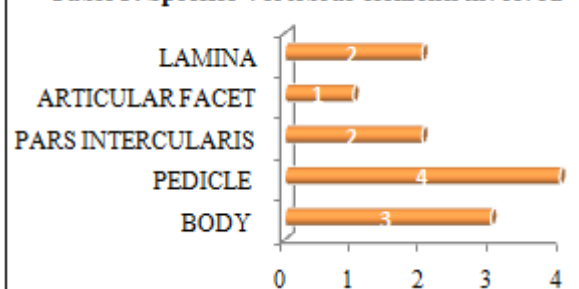


Table 4: Vertebrae involved by osteoid osteomas.



Table 5: Specific Vertebral elements involved



4. Discussion:(Images 1, 2 & 3)

Osteoid osteoma is a benign bone tumor, accounting for approximately 12% of all benign skeletal neoplasms.^[1] It occurs most frequently in young male patients between the first to third decades of life.^[2] The most common presenting symptom is pain, which characteristically worsens at night and is promptly relieved by the administration of salicylates.^[3] In our study, 260 patients presented with complaints of lower backache, which was also a

characteristic feature in all the 12 cases of osteoid osteomas. Painful scoliosis is another characteristic feature, which was evident in 66% cases (8 patients), which was also appreciated on antero-posterior radiographs of the spine. No clinical history of any trauma or fever was present. On clinical examination, no neurological deficits were noted. The laboratory investigations were unremarkable. Osteoid osteomas are mostly found in the long bones of extremities and posterior vertebral elements. Approximately 10 to 20% of osteoid osteomas occur in the spine,^[4] most commonly involving the lumbar segments, with a predilection for the posterior elements.^[5] In our study, 75% of osteoid osteomas (9 cases) were noted involving the posterior elements, with a predilection for the pedicle (4 cases) and the vertebral body (3 cases). They are characterized by the presence of an intracortical nidus with variable amount of calcifications, along with cortical thickening, sclerosis, and bone marrow edema.^[6] The presence of nidus was better appreciated on CT images, as compared to the MR imaging, appearing as a hypointense lesion with central mineralization and varying degrees of perinidal sclerosis.^[8,9] On MR imaging, nidus usually tends to have low-to-intermediate signal intensity on T1W and low-to-high signal intensity on T2W images.^[10] The associated features of cortical thickening, reactive sclerosis and bone marrow edema were better appreciated on MRI sequences than CT images.^[11] Edema is one of the major manifestations on MRI, appearing hypointense on T1W and hyperintense on T2W images.

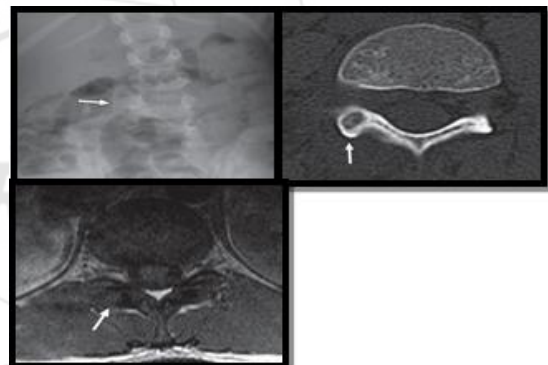


Image 1: (Case 1) AP radiograph of the L-S spine showing left convex scoliosis with subtle sclerosis over right aspect of L4. CT & T1W MR images showing a nidus in L4 right inferior facet with mild surrounding sclerosis.

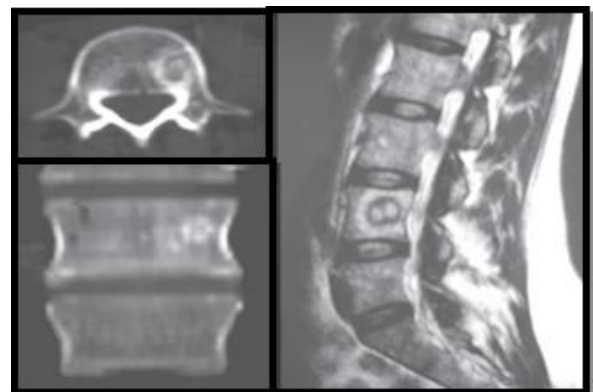


Image 2 (Case 2): CT & T2W MR images showing a nidus with mild adjacent sclerosis in body of L4 vertebra.

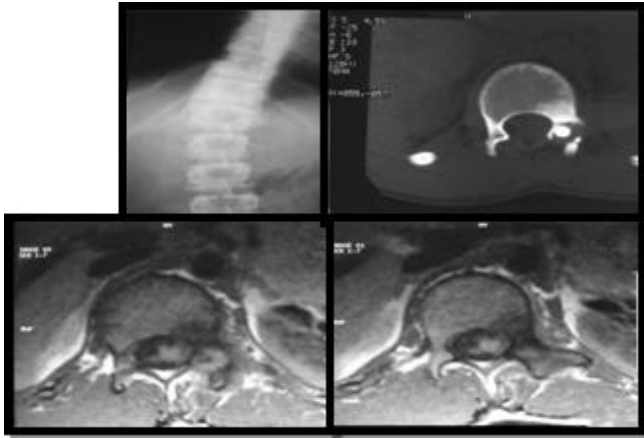


Image 3 (Case 3): A-P Radiograph showing scoliosis. CT axial sections showing a mixed lytic & sclerotic lesion in L1 left pedicle. T1W MR Images showing a focal low signal in L1 left pedicle with diffuse low signal intensity bone edema.

5. Management

Complete resection of the lesion is the most commonly accepted treatment method for osteoid osteomas, with a good prognosis. The most important determinant and factor for successful removal of the tumor is the exact localization of the lesion. Spinal osteoid osteomas are treated surgically, and curettage achieves desired results in the majority of cases.^[12] Curettage prevents any iatrogenic instability and the need for more extensive surgery. There have been few reports of recurrence in cases where curettage alone was performed,^[13] however, their number is very small. Recently, CT-guided percutaneous radiofrequency thermal ablation^[14] and laser photocoagulation^[15] have been offered as minimally invasive treatment, particularly in patients with incomplete lesion resection. Timing of the operation is of great significance, and should be performed as quickly as possible. There are few reports in the literature, where the tumor subsides without surgery,^[16] however, there is a high risk of progression of an antalgic scoliosis to a structural one.^[17]

6. Conclusion

Osteoid osteoma is a benign bone-forming & bone-producing tumor, characterized by the typical imaging findings of the presence of an intracortical nidus with fusiform cortical thickening, reactive sclerosis and bone marrow edema. The most common presenting feature is a painful scoliosis. A meticulous search for the nidus should be emphasized in a radiologic diagnosis and to differentiate it from other conditions. Compared with CT, MR imaging is of limited value in depicting the nidus.

References

- [1] Dahlin DC, Unni KK. Bone tumors: General aspects and data on 8,542 cases. 4th Ed., Springfield, Ill: Thomas, 1987; 88–101.
- [2] Lee EH, Shafi M, Hui JH. Osteoid osteoma: a current review. *J Pediatr Orthop* 2006;26(5):695–700.
- [3] Cerase A, Priolo F. Skeletal benign bone-forming lesions. *Eur J Radiol* 1998;27(suppl 1):S91–S97.

- [4] Saccomanni B. Osteoid osteoma and osteoblastoma of the spine: a review of the literature. *Curr Rev Musculoskelet Med*. 2009; 2: 65–67.
- [5] Imperiale A, Moser T, Ben-Sellem D, Mertz L, Gangi A, Constantinesco A. Osteoblastoma and osteoid osteoma: morphofunctional characterization by MRI and dynamic F-18 FDG PET/CT before and after radiofrequency ablation. *Clin Nucl Med*. 2009; 34: 184–188.
- [6] Chai JW, Hong SH, Choi JY, Koh YH, Lee JW, Choi JA, et al. Radiologic diagnosis of osteoid osteoma: from simple to challenging findings. *Radiographics* 2010; 30: 737–49.
- [7] Resnick D, Kyriakos M, Greenway GD. Tumors and tumor-like lesions of bone: imaging and pathology of specific lesions. In: Resnick D, Kransdorf MJ, eds. *Bone and joint imaging*. 3rd ed. Philadelphia, Pa: Saunders, 2005; 1120–1130.
- [8] Papatheassiou ZG, Megas P, Petsas T, et al. Osteoid osteoma: diagnosis and treatment. *Orthopedics* 2008; 31:1118–1127.
- [9] Gamba JL, Martinez S, Apple J, Harrelson JM, Nunley JA. Computed tomography of axial skeletal osteoid osteomas. *AJR Am J Roentgenol*. 1984; 142: 769–772.
- [10] Bartolozzi P, Floris G. Osteoid osteoma of the body of the first sacral vertebra. Case report. *Ital J Orthop Traumatol*. 1988; 14: 527–528.
- [11] Davies M, Cassar-Pullicino VN, Davies AM, McCall IW, Tyrrell PN. The diagnostic accuracy of MR imaging in osteoid osteoma. *Skeletal Radiol* 2002; 31(10):559–569.
- [12] Zileli M, Cagli S, Basdemir G, Ersahin Y: Osteoid osteomas and osteoblastomas of the spine. *Neurosurg Focus* 2003, 15:E5.
- [13] Haibach H, Farrell C, Gaines RW: Osteoid osteoma of the spine: surgically correctable cause of painful scoliosis. *CMAJ* 1986, 135:895-9.
- [14] Vanderschueren GM, Taminiau AH, Obermann WR, Bloem JL. Osteoid osteoma: clinical results with thermocoagulation. *Radiology*. 2002; 224: 82–86.
- [15] Woertler K, Vestring T, Boettner F, Winkelmann W, Heindel W, Lindner N. Osteoid osteoma: CT-guided percutaneous radiofrequency ablation and follow-up in 47 patients. *J VascInterv Radiol*. 2001; 12: 717–722.
- [16] Jayakumar P, Harish S, Nnadi C, Noordeen H, Saifuddin A: Symptomatic resolution of spinal osteoid osteoma with conservative management: imaging correlation. *Skeletal Radiol* 2007, 36:S72-6.
- [17] Mehta MH: Pain provoked scoliosis. Observations on the evolution of the deformity. *Clin Orthop Relat Res* 1978:58-65.