

• **Case report**

## **A rare presentation of osteoid osteoma in a rib and unexpected "double density sign": A case report and review of literature**

**E. Pirayesh\* and M. Amoui**

Department of Nuclear Medicine, Shohada-e Tajrish Medical Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Osteoid osteoma (OO) is a relatively common skeletal neoplasm, frequently involves long bones. OO of rib is extremely rare, including 0.23-2% of OO cases. Most of them arose in posterior arc, frequently in its head or neck and might lead to painful scoliosis. Involvement of anterior aspect of a rib is extremely rare. Skeletal scintigraphy is highly sensitive for detection of OO. "Double density sign"; a typical pattern in bone scintigraphy is usually seen in OO of cortical bones. The current study presents a case of 22-year-old man with OO in anterior arc of a rib, revealed double density sign on <sup>99m</sup>Tc-MDP scan. *Iran. J. Radiat. Res.*, 2012; 10(3-4): 197-199

**Keywords:** *Osteoid osteoma, rib neoplasms, bone scintigraphy.*

### **INTRODUCTION**

Osteoid osteoma (OO) is a relatively common skeletal neoplasm and accounts for about 10% of all benign primary bone tumors. Patients with OO are usually young and about 70% of cases are in the first two decades of life. Almost always, the most clinical presentation is pain, frequently becomes worse at night <sup>(1)</sup>. It may occur in virtually any bone, although the majority (about 60%) of lesions arises in the cortex of long bones. Of the remaining lesions, approximately 30% are equally distributed among the spine, hand and foot <sup>(2)</sup>. OO of rib is extremely rare, including 0.23-2% of OO cases. In addition, it is an uncommon lesion of ribs, accounting for 1-1.4% of primary tumors apart from myeloma <sup>(3)</sup>.

The present case shows an uncommon presentation of OO and highlights the importance of pattern recognition of bone scintigraphy in accurate diagnosis.

### **CASE PRESENTATION**

A twenty-two years old man was referred to our department with a 2 months history of pain and tenderness over left middle ribs. The pain was persistent and burning, localized to the anterior arc of a mid rib. The pain responded to NSAIDS as ibuprofen. In physical examination, there was severe point tenderness to palpation of the left rib. The patient did not have any other musculoskeletal problem or history of recent trauma and laboratory tests as CBC and ESR were within the normal limits.

Three phasic bone scan was performed after IV injection of 740 MBq (20mCi) Tc-99m methylene diphosphonate (<sup>99m</sup>Tc-MDP). Images were obtained using single head gamma camera, e-cam (Siemens, Germany), equipped with a low energy high resolution (LEHR) collimator. There was a focal zone of activity in flow and blood pool phases in mid left. On delayed images, more localized activity was seen in anterior aspect of 6<sup>th</sup> left rib and a second smaller hot spot within it (figure 1). This finding is suggestive of "double density sign", which is the typical pattern of osteoid osteoma with high specificity <sup>(4, 5)</sup>. No additional lesions were identified.

Two weeks later, surgical resection was performed and histologic examination

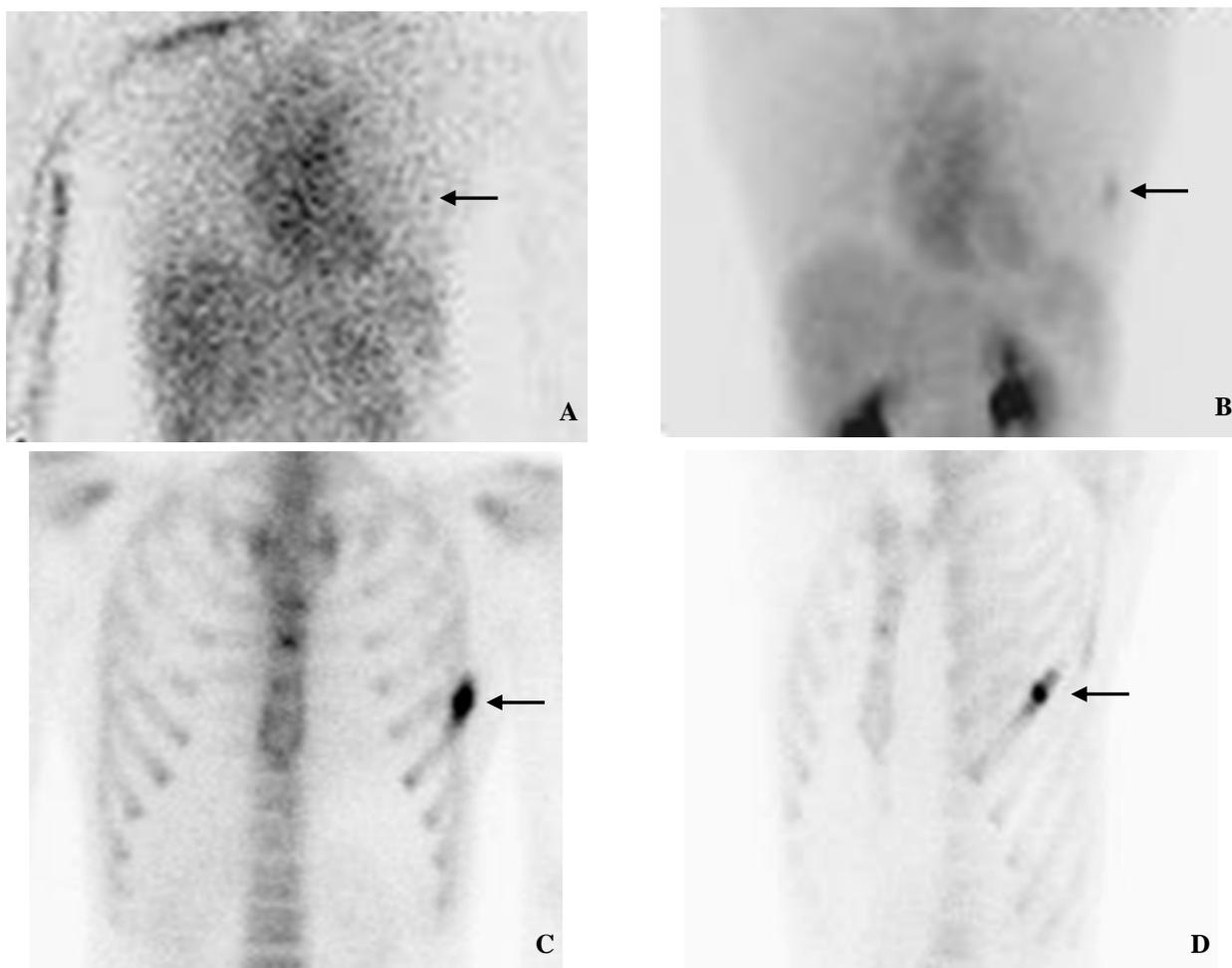
#### **\*Corresponding author:**

Dr. Elahe Pirayesh,

Department of Nuclear Medicine, Shohada-e Tajrish Medical Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Fax: +98 21 22723263

E-mail: [elahe\\_pirayesh@yahoo.com](mailto:elahe_pirayesh@yahoo.com)



**Figure 1.** A) Angiographic phase reveals a small focal activity in left side of chest. B) Blood pool images (Anterior view) showing a focus of increased uptake in a mid rib. C) Anterior and D) Left anterior oblique views of chest demonstrating an isolated area of intense radiotracer uptake, surrounded by area of increased activity, in anterior aspect of the left sixth rib.

confirmed the diagnosis of an osteoid osteoma.

## DISCUSSION

Osteoid osteoma, first introduced by Jaffe in 1935<sup>(6)</sup>, accounts for about 10% of all benign primary bone tumors and consists of osteoid and woven bone, surrounded by a halo of reactive sclerotic bone. It predominantly occurs in the appendicular skeleton and spine<sup>(1)</sup>. OO of the ribs is extremely rare, including 0.23-2% of OO cases<sup>(3)</sup>. Most of the reported cases of OO in a rib arose in posterior arc, frequently in its head or neck and might lead to painful scoliosis<sup>(3,7-15)</sup>. Involvement of

anterior aspect of a rib is extremely rare, and there are just few reported ones<sup>(16)</sup>.

Skeletal scintigraphy is highly sensitive for detection of OO and is able to demonstrate even the smallest lesions. The role of bone scan in the evaluation of OO is to help define the precise location of lesions (particularly in areas of complex anatomy or when the initial radiographs are negative or atypical), intraoperative localization of the nidus and postoperative evaluation to confirm complete removal of the nidus<sup>(1, 2)</sup>. The scintigraphic appearance of an OO is a round, localized lesion with increased accumulation of technetium-labeled phosphonates in three phases of bone scan. Double density sign, an area of intense focal

activity corresponding to the nidus with a surrounding area of slightly lesser intensity produced by the reactive sclerosis, is quite specific for diagnosis of this benign tumor<sup>(4,5,17)</sup>. In cortical bones, nidus almost always is surrounded by reactive bone sclerosis, but if a cancellous bone is affected, bone sclerosis around the nidus is minimal or even absent and the tumor might protrude out of the bone due to minor periosteal reaction and bone formation. Plain radiograph or CT might fail to diagnose OO of cancellous bones, due to the lack of perinidal density alteration, as well<sup>(1,2)</sup>. This could be an explanation for rare visualization of double density sign in cancellous bones, as vertebrae<sup>(17)</sup> and we found no example of this pattern of OO of ribs described in English language medical literature, as well. In our knowledge, this is the first reported case has explained double density sign of costal OO.

Due to intense accumulation of radionuclide in the nidus of OO, it should be kept in mind to acquire low count images or observing images with low intensity, in order to differentiate focal uptake of nidus from the surrounding reactive new bone. It has been proven pinhole magnification imaging is superior to high resolution planar scintigraphy for revealing this pattern, as well<sup>(17)</sup>.

As a conclusion, this case study shows a rare presentation of OO in anterior arc of the rib, accompanying by prominent reactive bone formation, which led to typical pattern of double density sign, not commonly seen in cancellous bones.

## REFERENCES

1. Kitsoulis P, Mantellos G, Vlychou M (2006) Osteoid osteoma. *Acta Orthop Belg*, **72**: 119-25.
2. Kransdorf M, Stull MA, Fredrick W, Gilkey, Moser RP (1991) Osteoid osteoma. *Radiographics*, **11**: 671-96.
3. Hughes EK, James SLJ, Butt S, Davies AM, Saifuddin A (2006) Benign primary tumours of the ribs. *Clin Radiol*, **61**: 314-22.
4. Helms CA (1987) Osteoid osteoma, the double density sign. *Clin Orthop Relat Res*, **222**:1 67-73.
5. Helms CA, Hattner RS, Vogler JB (1984) Osteoid osteoma: radionuclide diagnosis. *Radiology*, **151**: 77.
6. Jaffe HL (1935) "Osteoid osteoma" : a benign osteoblastic tumor composed of osteoid and atypical bone; report of five cases. *Arch Surg*, **31**: 709-28.
7. Hoeffel JC, Lascombes P, Delgoffe C, Aymard B, Galley MA (1993) Osteoid osteoma of the rib: a case report. *J Pediatr Surg*, **28**: 738-40.
8. Lynch MC, Dorgan JC (1986) Osteoid osteoma of a rib as a cause of scoliosis: a case report. *Spine*, **11**: 480-2.
9. Kehl DK, Alonso JE, Lovell WW (1983) Scoliosis secondary to an osteoid osteoma of the rib. *J Bone Joint Surg [Am]*, **65**: 701-3.
10. Veluvolu P, Winkler T, Sajjad SM, Leer RA, Fontanni SM (1992) Osteoid osteoma involving body of right rib, preoperative localization and postoperative confirmation. *Clin Nucl Med*, **17**: 895-6.
11. Denis F, Armstrong WD, G (1984) Scolio-genic osteoblastoma of the posterior end of the rib. *Spine*, **9**:74.
12. Lynch MC, Dorgan JC (1986) Osteoid osteoma of a rib as a cause of scoliosis. *Spine*, **11**: 480-2.
13. Mehdian H, Summers B, Eisenstein S (1988) Painful scoliosis secondary to an osteoid osteoma of the rib. *Clin Orthop Relat Res*, **230**: 273-276.
14. Cossetto D, Cummine J (1991) Rapidly growing twelfth rib osteoid osteoma. *Aus N Z J Surg*, **61**: 862-4.
15. Murat T, Meltem C (2002) Osteoid osteoma of the rib detected on bone scintigraphy: importance of pattern recognition. *Clin Nucl Med*, **27**:2 16-7. [Abstract]
16. McDermott MB, kyriakos M, McEnery K (1996) Painless osteoid osteoma of the rib in an adult, a case report and a review of the literature. *Cancer*, **77**: 1442-9.
17. Roach PJ, Connolly LP, Zurakowski D, Treves ST (1996) Osteoid osteoma: comparative utility of high-resolution planar and pinhole magnification scintigraphy. *Pediatr Radiol*, **26**: 222-5.

