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## International Journal of Surgery Case Reports

journal homepage: [www.casereports.com](http://www.casereports.com)

## Atypical location of an osteoid osteoma with atypical anterior knee pain

Mutlu Harun<sup>a,\*</sup>, Yaldız Hayrettin<sup>a</sup>, Mutlu Serhat<sup>b</sup>, Cetinkaya Engin<sup>c</sup>, Cepni Kamil<sup>d</sup>, Arslan Armagan<sup>e</sup>, Parmaksızoglu Atilla Sancar<sup>a</sup><sup>a</sup> Department of Orthopaedics, Taksim Training and Research Hospital, Istanbul, Turkey<sup>b</sup> Department of Orthopaedics, Kanuni Sultan Suleyman Training and Research Hospital, Istanbul, Turkey<sup>c</sup> Department of Orthopaedics, Baltalimani Training and Research Hospital, Istanbul, Turkey<sup>d</sup> Department of Orthopaedics, İnebolu Government Hospital, Kastamonu, Turkey<sup>e</sup> Department of Orthopaedics, Tatvan Government Hospital, Bitlis, Turkey

## ARTICLE INFO

## Article history:

Received 30 April 2014

Received in revised form 1 October 2014

Accepted 8 October 2014

Available online 17 October 2014

## Keywords:

Osteoid osteoma

Intra-articular

Nidus

Knee pain

## ABSTRACT

**INTRODUCTION:** An osteoid osteoma is a painful tumor that most commonly affects the extra-articular parts of the long bones. An intra-articular location of an osteoid osteoma is rare. Various differential diagnoses may arise in connection with such an unusual location because it causes atypical clinical signs. **PRESENTATION OF CASE:** A 24-year-old male developed pain in the central region of the right knee. Magnetic resonance imaging (MRI) showed no clear pathology in the knee joint. A technetium bone scan and computed tomography (CT) were then ordered and confirmed the presence of an osteoid osteoma in the knee joint. The patient was treated through an anteromedial approach to the knee, and the lesion was removed by excisional biopsy under fluoroscopy.

**DISCUSSION:** The diagnosis of intra-articular osteoid osteoma is challenging because the clinical presentation can be misleading. MRI is often requested as the first imaging method when dealing with knee symptoms, and radiologists are often unaware of the clinical presentation. Edema seen on MRI can be misleading with respect to the location of the nidus. CT is considered to be the best imaging method because it usually allows for clear visualization of the nidus. Different treatments have been proposed, ranging from open excision to arthroscopic resection.

**CONCLUSION:** Osteoid osteoma should be considered in young adult patients with chronic knee pain and no history of trauma.

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## 1. Introduction

An osteoid osteoma is a common, benign osteoblastic tumor less than 2 cm in diameter. It presents between the ages of 10 and 35 years and exhibits a male:female ratio of 2:1. It accounts for 2–3% of all bone tumors and 10–15% of all benign bone tumors. It is typically located on the diaphysis and metaphysis of the long bones.<sup>1,2</sup> Osteoid osteoma is a painful tumor that most commonly affects the extra-articular parts of the long bones. An intra-articular location of an osteoid osteoma is rare (10–12% of cases).<sup>3–5</sup> Localization at an extra-articular site typically causes pain that worsens at night and responds dramatically to salicylates. Various differential diagnoses

may arise in connection with such an unusual location because it causes atypical clinical signs.

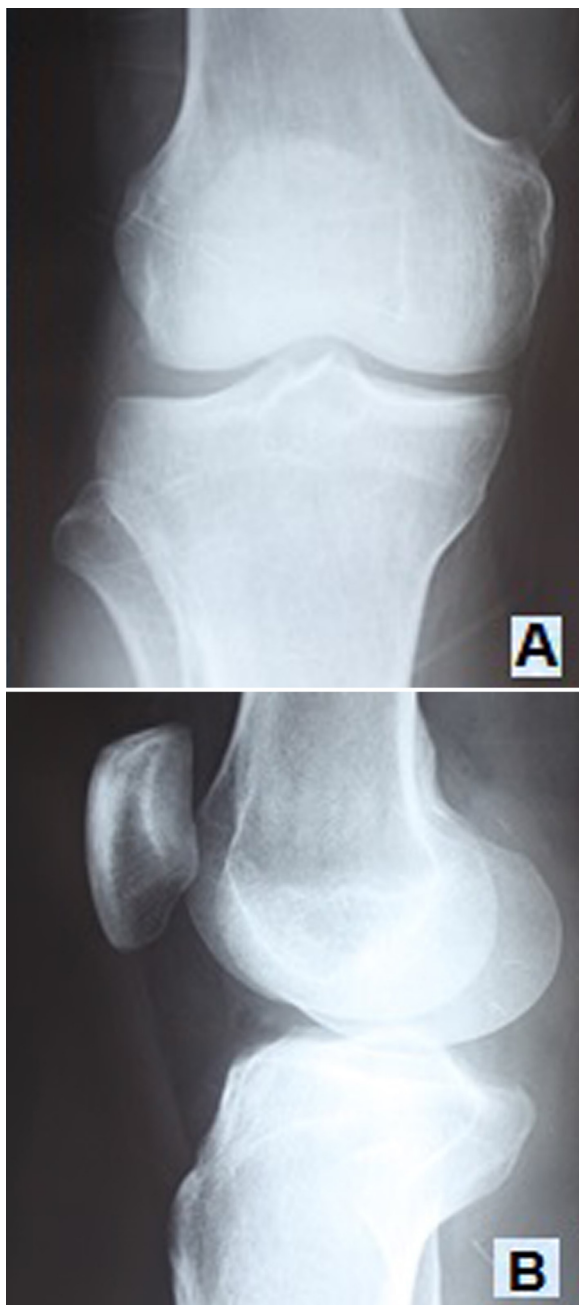
Osteoid osteoma has a central nidus surrounded by bone sclerosis. Conventional radiographs can show the nidus as a small lytic area surrounded by a radiolucent ring. Computed tomography (CT) is the most sensitive imaging modality because it usually allows for clear visualization of the radiolucent cortical nidus, which is sometimes calcified, and is generally surrounded by medullary sclerosis and a periosteal reaction.<sup>4,6,7</sup> The role of magnetic resonance imaging (MRI) in the diagnosis of osteoid osteoma is controversial because extensive edema and soft tissue reaction can obscure the nidus. On the other hand, bone scintigraphy is a useful technique for identification of lesions that cannot be seen on conventional radiographs.

## 2. Presentation of case

A 24-year-old male developed nighttime pain in the central region of the right knee during a 1-year period. He began to also

\* Corresponding author at: Orthopedics and Traumatology Department, Taksim Education and Research Hospital, Karayollari Mahallesi, Osmanbey Caddesi, No: 120, 34255 Gaziosmanpaşa, Istanbul, Turkey. Tel.: +90 555 623 26 23; fax: +90 212 945 30 00.

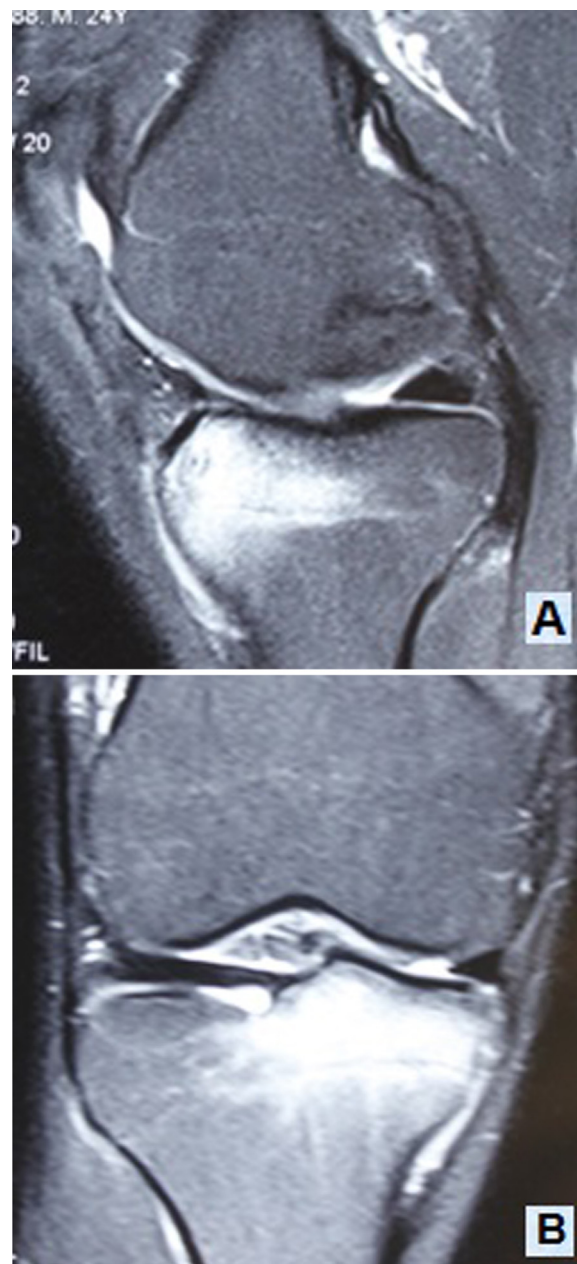
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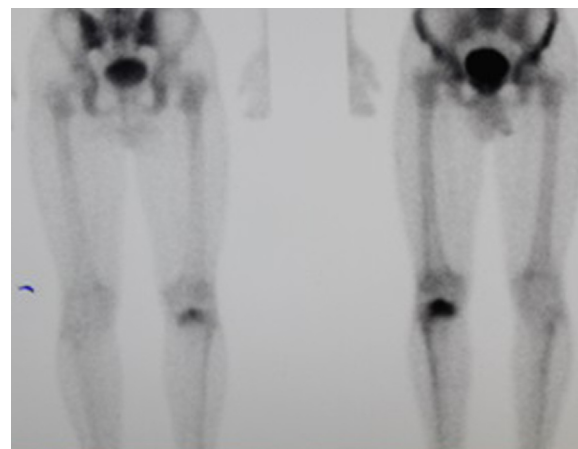
**Fig. 1.** Anteroposterior (A) and lateral (B) right knee X-rays are normal.

feel pain while walking 4 months after the pain began. There was no history of trauma. Radiographs of the right knee showed no abnormalities (Fig. 1A and B). His general physical examination findings were normal. He was initially treated with a nonsteroidal anti-inflammatory drug and was instructed to limit his sports activity. Three weeks later, he had experienced no improvement and returned for a follow-up examination. A knee MRI examination depicted a signal abnormality and nonspecific bone marrow edema at the anterior portion of the proximal tibial metaphysis (Fig. 2A and B). The MRI showed no clear pathology in the other structures of the knee joint. Laboratory test results were normal. A technetium bone scan (Fig. 3) and CT were then performed to verify the lesion in the knee joint (Figs. 4A and 5A).

Treatment was performed through an anteromedial approach to the knee, and the lesion was removed via excisional biopsy under fluoroscopy. The removed bone specimen confirmed the



**Fig. 2.** Sagittal (A) and axial (B) MRI show an area of diffuse bone marrow edema in the right knee.



**Fig. 3.** Technetium bone scan revealing increased uptake in the right knee.



Fig. 4. Preoperative sagittal (A) and postoperative sagittal (B) CT scans.

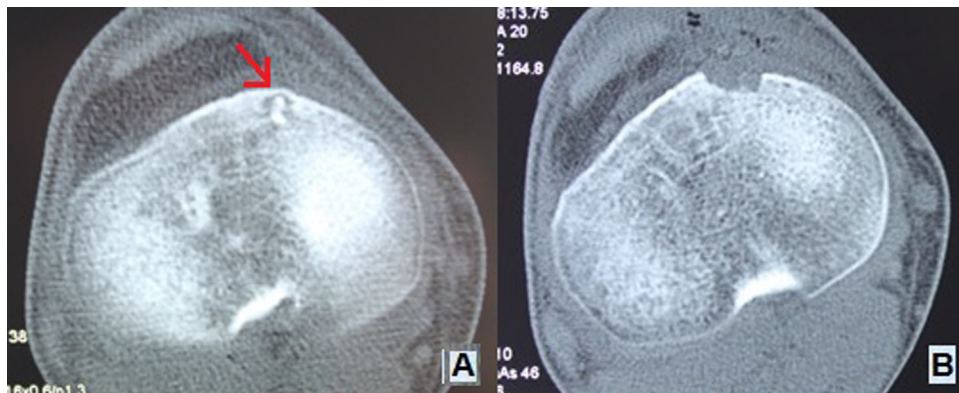


Fig. 5. Preoperative axial (A) and postoperative axial (B) CT scans.

preoperative diagnosis of osteoid osteoma (Fig. 6). After the operation, CT was ordered to verify the absence of the nidus (Figs. 4B and 5B). The patient was discharged approximately 1 day after surgery. Partial weight-bearing was allowed 10 days after the operation, and full weight-bearing was permitted 3 weeks after the operation. His symptoms were relieved after the treatment. The patient recovered full function of the knee with no pain and no limitations in his activities of daily living. At the 1-year follow-up evaluation, he was symptom-free.

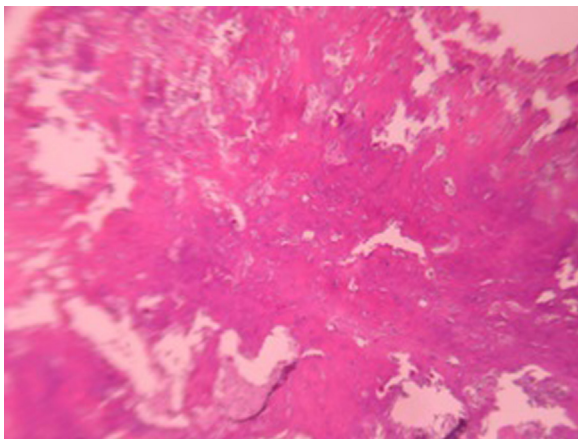


Fig. 6. Histopathological findings of the mass excised from the proximal tibia (hematoxylin and eosin, original magnification  $\times 40$ ).

The patient was informed that the data concerning his case would be submitted for publication.

### 3. Discussion

Osteoid osteoma is a small benign tumor comprising a central core of vascular osteoid tissue and a peripheral zone of sclerotic bone. This tumor occurs most commonly in young adults.<sup>1</sup> It is characterized by typical night pain. Because of its typical radiological appearance and clinical signs, osteoid osteoma does not represent a diagnostic challenge. CT is considered to be the optimum imaging method because it usually allows for clear visualization of the nidus, which is sometimes calcified and surrounded by medullary sclerosis and a periosteal reaction.<sup>1–4</sup>

The diagnosis of intra-articular osteoid osteoma is challenging because the clinical presentation can be misleading. Affected patients commonly develop joint tenderness, synovitis, and joint effusion. The knee is at particular risk of delayed diagnosis because of the high incidence of other intra-articular lesions.<sup>3,5</sup> If the diagnosis is delayed, the symptoms can simulate a monoarthritis, further confusing the diagnosis.<sup>6</sup> The mean time to diagnosis of an intra-articular osteoid osteoma is 26.6 months, which is considerably longer than the 8.5 months required for extra-articular locations (range, 4 months to 5 years).<sup>3</sup> Franceschi et al. described four patients in whom the diagnosis of an intra-articular osteoid osteoma was delayed from 1 to 10 years.<sup>2</sup> The difficulties in diagnosing osteoid osteoma in patients presenting with knee pain are illustrated by the fact that plain radiographs may only correctly diagnose 20% of the cases.<sup>4</sup> MRI is often requested as the first imaging method when dealing with knee symptoms, and radiologists are

often unaware of the clinical presentation. Edema seen on MRI can be misleading with respect to the location of the nidus.<sup>3,7</sup> Technetium scintigraphy can be used to identify lesions that cannot be seen on conventional radiographs; CT should then be used to confirm the correct diagnosis.<sup>7</sup> The histopathological criteria for the diagnosis of an osteoid osteoma are typically a small yellowish to red pea-sized nidus of osteoid and woven bone with interconnected trabeculae and a background and rim of highly vascularized fibrous connective tissue. A variable degree of sclerotic bone reaction may surround the lesion.<sup>7,8</sup>

Various treatments have been proposed, ranging from open excision to arthroscopic resection. Minimally invasive techniques, in particular radiofrequency thermoablation, are the treatment of choice. CT-guided radiofrequency ablation has been gaining popularity due to the low rate of complications together with a success rate of ~90–95%. In the case of an intra-articular location, it is particularly important to avoid any intervention which causes damage or weakening.<sup>6,9,10</sup>

The methods of treatment, open surgical exposure and excision, is being challenged with today's technology. New methods such as CT-guided percutaneous excision, interstitial laser photocoagulation, and radiofrequency coagulation claim success in treatment of osteoid osteomas. Only the last of these techniques has been compared with open excision and curettage of the lesion; the results indicate that percutaneous radiofrequency coagulation was essentially equivalent to operative en bloc excision.<sup>11,12</sup>

We have presented a case that clearly shows the difficulty in correctly diagnosing intra-articular osteoid osteoma. When typical clinical features appeared in this case, the possibility of osteoid osteoma was considered. This case illustrates the importance of appropriate identification of clinical findings and the need to consider uncommon causes of knee joint pain when MRI is not conclusive.

#### 4. Conclusion

Intra-articular osteoid osteoma can simulate several other articular pathologies with other clinical symptoms. The diagnosis may be delayed in these patients. In young adult patients with chronic knee pain and no history of trauma, osteoid osteoma should be considered.

#### Conflict of interest

No conflict of interest was declared by the authors.

#### Funding

The authors declared that this study has received no financial support.

#### Ethical approval

Written informed consent was obtained from the patient who participated in this case.

#### Author contributions

HM, HY, SM, KÇ, AA, EÇ and ASP were involved in the conception, design and interpretation. HM, HY and SM wrote the manuscript. KÇ, EÇ, AA and ASP collected data, reviewed relevant published reports and provided the images. All authors read and approved the final manuscript.

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