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Case Report

A rare pathology in the differential diagnosis of joint pain: Intraarticular osteoid osteoma

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Abstract: Osteoid osteoma (OO) is a benign osteoblastic tumor of bone that usually affects children and young adults. They are usually located on the metaphysis or diaphysis of long bones. Their clinical, anamnesis and radiological findings are typical. Intra-articular OO however, has different properties due to its placement within joints. Sclerosis around the lesion is either minimal or non-existent, but synovitis can be seen in the joint. For this reason, they are usually diagnosed later. In this case series, we diagnosed three cases (2 ankles and 1 hip joint) that were diagnosed with osteochondral lesions previously and had chronic pain that did not respond to several treatments in different centers with intra-articular OO and treated them with radiofrequency ablation using computerized tomography. Knowing the radiological properties of intra-articular OO and being aware of this condition during the differential diagnosis of joint pain cases will be useful to diagnose this rare pathology.

Keywords: osteoid osteoma; radiological properties; rare pathology; case reports

1. Introduction

Osteoid osteoma (OO) is an osteoblastic bone tumor that makes up about 10% of all benign bone tumor cases. It commonly affects children and young adults. Males are two times more susceptible to this condition than females. Its classic clinical symptoms include worsening pain at night, which responds well to salicylate [1,2]. They are usually formed from diaphyseal or metaphyseal cortex regions of long bones [3]. Osteoid osteoma is characterized by an intracortical nidus, cortical thickening, sclerosis and bone marrow edema. They are rare in intramedullary and trabecular bones [4,5].

Intra-articular OO is seen within or adjacent to joints [1]. It doesn't necessarily cause pain that worsens during nighttime [3]. Atypical clinical findings and an uncommon placement site of the OO make the diagnosis of this condition relatively difficult [6]. Its common radiological properties include minimal sclerosis around the lesion and the presence of synovitis.

This study would like to present 3 different intra-articular OO cases diagnosed in the late stage of the disease.

2. Case report

A 31-year-old female (patient 1) presented to an orthopedics clinic for ankle pain. The patient reported that she had previously been clinically diagnosed with osteochondral lesion (OLT) in the talus and was under follow-up for this reason. She said that her complaints did not become better against the various types of treatments, such as glucosamine, undenatured type II collagen, hyperbaric oxygen therapy, partially weight bearing and paracetamol, she received for this condition. Physical examination showed no significant pathological findings apart from ankle pain, which was independent of time and motion. The patient had complaints in a single ankle and had no previous history of trauma. Laboratory results showed no significant pathology. Magnetic Resonance Imaging (MRI) studies showed a lesion in the talus anterior placed in a subcortical area that is surrounded by prominent medullar edema. There was synovial fluid, which was hypointense on T1-weighted images and hyperintense on T2-weighted images. There were also increased signals on T2-weighted images within adjacent soft tissues and marked contrast uptake and a remarkable thickening of synovial tissue and joint capsule in lesion-adjacent areas (**Figure 1**). In the patient history, the absence of findings in the talus, which might lead to OLT diagnosis, contrast involvement in the synovial tissues and accompanying significant medullar edema and an atypical placement of the lesion for an osteochondral lesion showed a necessity for a differential diagnosis and to exclude a rare pathology such as intra-articular OO. Thus, a computerized tomography (CT) study was done.

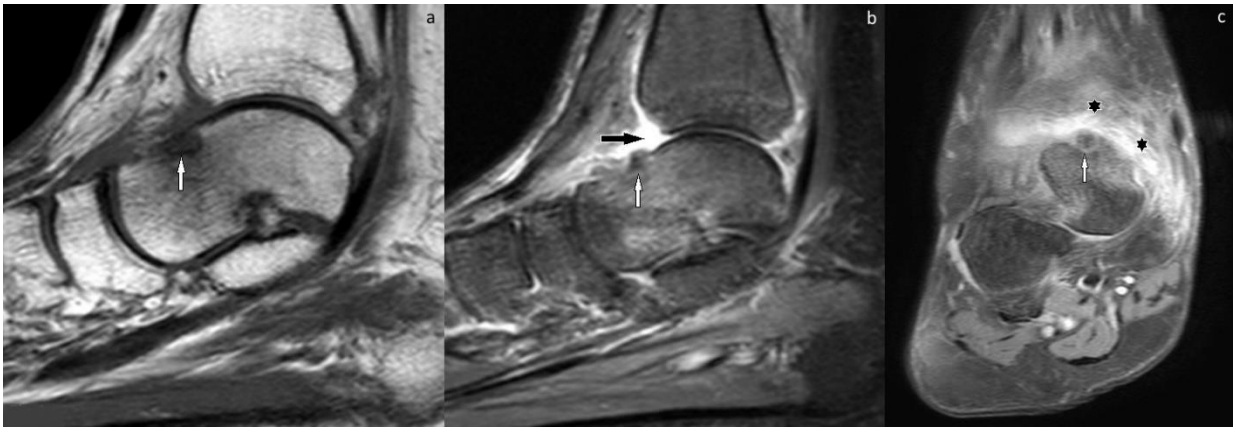

Figure 1. A 31-year-old female patient. (**a**) (Sagittal TSE T1), (**b**) (Sagittal STIR T2), (**c**) (Coronal PD SPAIR)—In those images, there is nidus (white arrow) with millimetric calcifications in midline of the anterior superior talus and slight effusion within joint (black arrow). There is significant medullar edema in talus. Increased synovial tissue, edema and inflammation are noticeable (asterisk). STIR-Short tau inversion recovery, SPAIR—Spectral Selection Attenuated Inversion Recovery.

CT studies showed a hypodense nidus with millimetric dense dot appearances within the lesion's central region (millimetric calcifications within hypodense nidus). There was no increased density that was compliant with significant reactive sclerosis around the lesion (**Figure 2**). The pain of the patient ceased after percutaneous CT-guided radiofrequency ablation (RF ablation) treatment. No residual lesions were detected in the 6th and 12th months of treatment during the follow-up period (**Figure 3**).

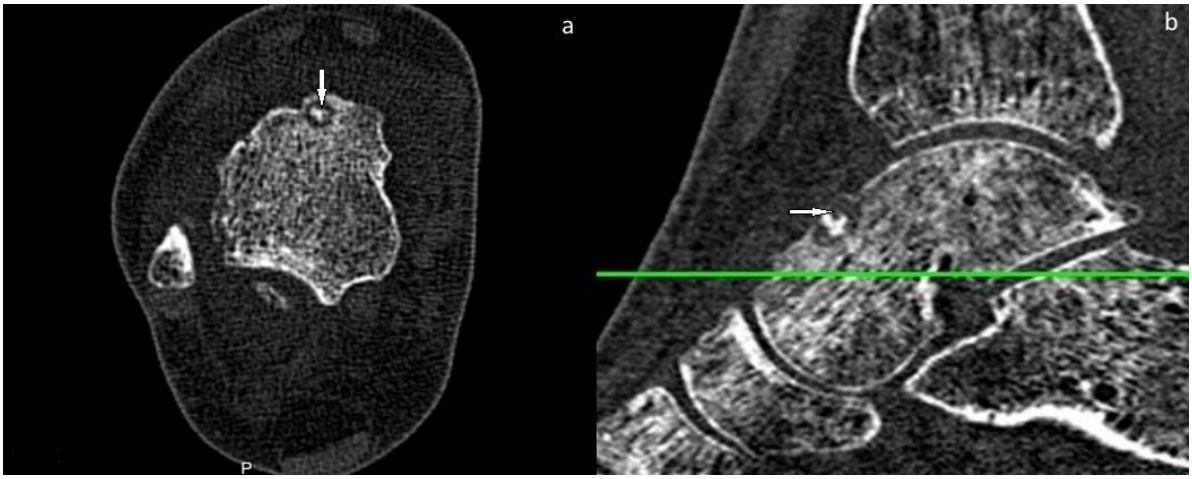

Figure 2. A 31-year-old female patient. Thin-slice, non-contrast (**a**) (axial), (**b**) (sagittal) reformatted CT images show no significant sclerosis in talus anterior and midline and the other joints in the ankle showed that the joint spaces were saved and joint surfaces were regular. CT—Computed Tomography.

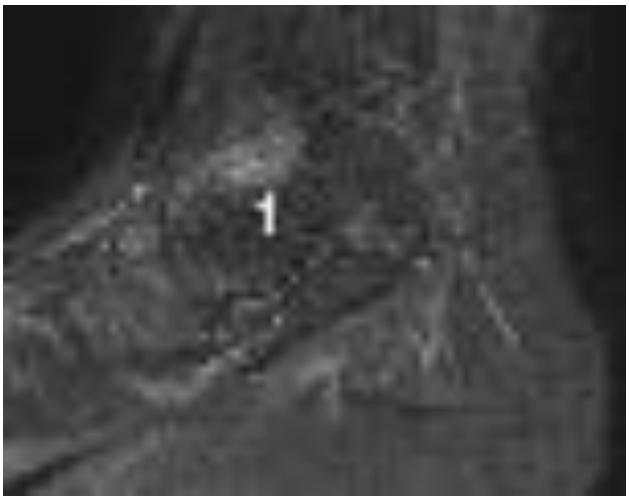

Figure 3. A 31-year-old female patient. (Sagittal STIR T2). In control Magnetic Resonance Imaging study done in 6th month following Radiofrequency ablation, there are post-operative changes in the lesion site (arrow). There is no edema in talus, effusion in joint space or synovial proliferation. STIR—Short tau inversion recovery.

A 34-year-old male (patient 2) came to the orthopedics clinic for a pain that was going on for 4 years. Again, this patient's main complaint was ankle pain and there was no previous history of trauma. Physical examination and laboratory results revealed no pathology other than pain. The pain didn't change with the movement nor did it become worse at night. MRI studies showed a heterogeneous structured lesion in the medial talus placed in the subcortical area adjacent to the talotibial joint, surrounded by marked medullar edema and intra-articular synovial fluid, which was hypointense on T1-weighted images and hyperintense on T2-weighted images. There was minimal thickening in neighboring joint capsule and synovial tissue and increased signals on T2-weighted images in surrounding soft tissues (**Figure 4**). The same treatments received for osteochondral lesions in previous clinics as mentioned in Case 1 were unsuccessful and there was no improvement in patient's condition. In addition

to this, a lack of significant difference in lesion morphology with time and the expected regression of medullar edema warranted an advanced CT study in this case.

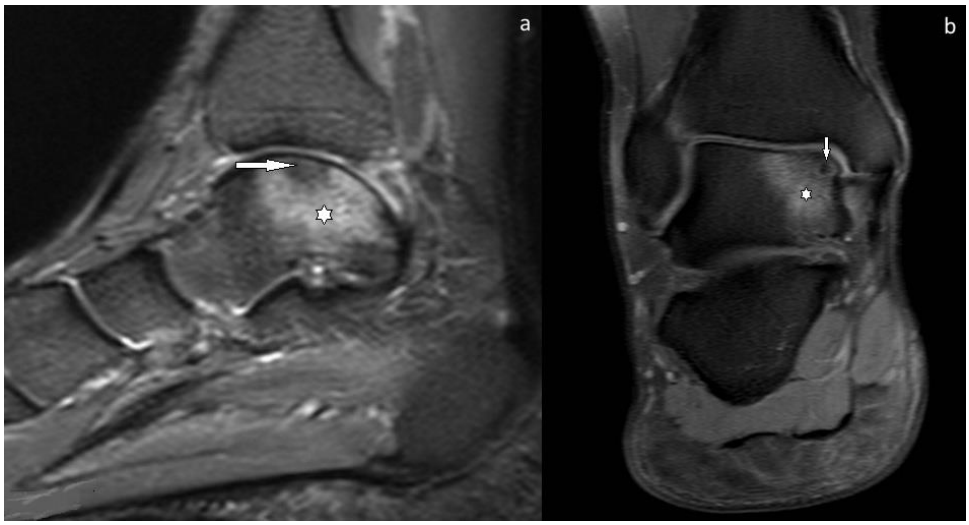

Figure 4. A 34-year-old male patient with ankle pain. (**a**) (Sagittal STIR T2), (**b**) (Coronal PD SPAIR). Images show significant medullar edema (asterisk) around nidus (arrow) in medial subcortical area without any irregularities on talus joint surface. STIR-Short tau inversion recovery, SPAIR—Spectral Selection Attenuated Inversion Recovery.

On CT examination, same-level millimetric calcifications within hypodense nidus were noticed. There was no increased density that was compliant with significant reactive sclerosis around the lesion, as characteristic of classical osteoid osteomas (**Figure 5**). The clinical outcome of the patient improved significantly following RF ablation treatment. No residual lesions were detected in the 18th month of the treatment during the follow-up period.

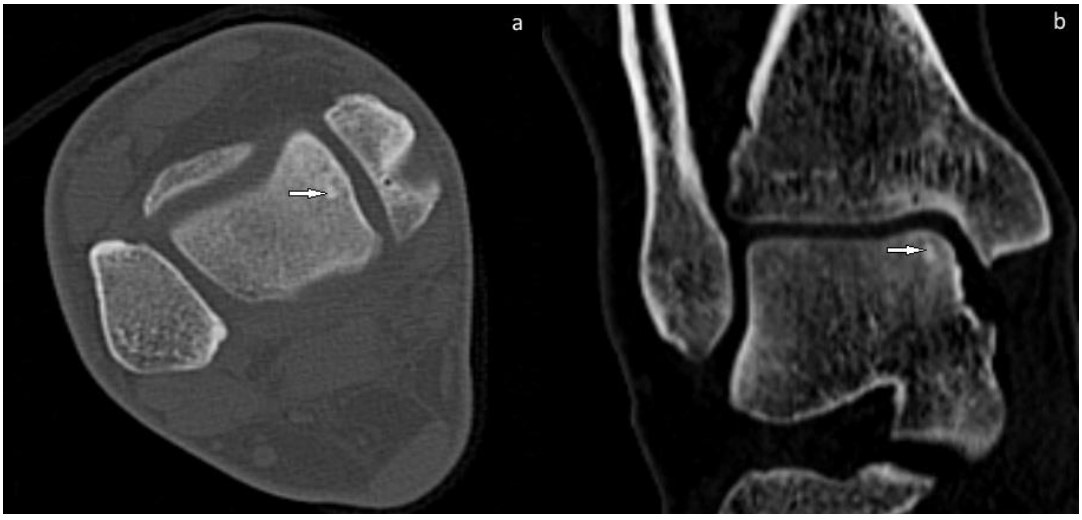

Figure 5. A 34-year-old male patient with ankle pain. Thin-slice, non-contrast (**a**) (axial), (**b**) (coronal) reformatted CT images do not show significant sclerosis in the talus medial, but a hypodense nidus with a partially calcified center is visible in the talus (white arrow). No significant irregularities were detected on lesion localization and other joint surfaces. CT—Computerized Tomography.

A 27-year-old male (patient 3) presented to an orthopedics clinic for chronic hip pain ongoing for 3 years. Physical examination showed no significant findings except

for pain. Laboratory results were inconclusive. The pain intensity did not change with daytime movement or NSAIDs. MRI examination revealed a hypointense on T1-weighted and slightly hyperintense on T2-weighted images subcortical lesion in the right femoral head, laterally which caused a slight focal irregularity in the adjacent cortex with a calcified center and nodular hypointensity on T1-weighted images. No significant sclerosis was seen around the lesion. There was also no significant effusion or synovial hypertrophy in neighboring joint spaces. On CT examination, there was nodular calcification in the central nidus but there was no significant reactive sclerosis around the joint (**Figure 6**). The clinical outcome of the patient improved after RF ablation treatment. No residual lesions were noticed in the 8th month of the treatment during follow-up period.

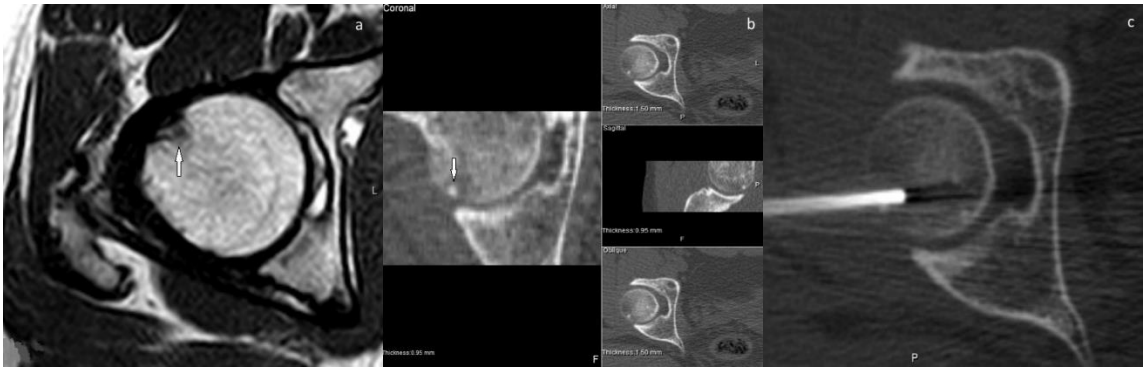

Figure 6. A 27-year-old male patient with chronic hip pain. (**a**) (Axial TSE T1 MR), (**b**) (thin-slice, non-contrasted axial and other plans reformatted CT), (**c**) (Percutaneous CT-guided radiofrequency ablation in axial plane) images show intra-articular osteoid osteoma in the anterior superior femoral head (white arrow). RF—Radiofrequency ablation, MR—Magnetic Resonance, CT—Computerized Tomography.

3. Discussion

Intra-articular OO is placed within the joint capsule and usually involves the hip joint. The instances where it is seen in ankle, wrist, elbow, and knee joints are quite rare [1]. Intra-articular OO makes up about 10% of all osteoid osteomas [3]. In our 3 cases, 2 of them were in the ankle and one of them was in the hip joint.

Intra-articular OO does not necessarily cause pain that worsens during nighttime [3]. Chronic pain that does not respond well to salicylic acid is the most important clinical finding of intra-articular OO. Likewise, in our cases, there was no pain history that worsened at night and responded well to salicylic acid. For this reason, clinical diagnosis of intra-articular OO is usually quite difficult [7]

Radiological properties of intra-articular OO differ from intracortical OO. The characteristic MRI morphology of an intra-articular osteoid osteoma (OO) includes synovitis and joint effusion, which are always present and differentiate it perfectly from an extra-articular osteoid osteoma [8]. CT scans typically show a well-defined hypodense nidus with a partially calcified centre and minimal or absent surrounding sclerosis, which can make it difficult to detect. On MRI examination, bone marrow edema findings on T2-weighted images in addition to hypointense sclerosis around contrasted nidus are seen in osteoid osteoma. Synovial thickening can be seen in intra-

articular OO [3]. Moreover, there is significant joint effusion that accompanies soft-tissue edema [9]. In cases with ankle involvement (case 1 and 2), although effusion within the joint was seen during the pre-treatment period, there was neither joint effusion nor synovial hypertrophy in our hip-joint case (case 3). In intra-articular osteoid osteoma, there was either minimal cortical thickening or none at all [1]. For this reason, it is easy to overlook radiolucent nidus in radiographs and scintigraphy does not show classical properties of osteoid osteoma. In all of our cases, reactive cortical thickening was not seen on radiography or CT images.

In intra-articular OO, hypertrophic changes seen in osteoarthritis can be noticed. The joint space might be narrowed on a single side or can be widened by synovitis and effusion [9]. For those reasons, the mean period for a definite diagnosis of intra-articular OO is around 2.5–3.5 years [9]. In our series, the mean period for diagnosis was 3 years.

Intra-articular OO is usually misinterpreted as osteochondral lesions both in the clinic and radiological studies. In clinical examination, the most important finding is the pain seen with palpation of the osteoid osteoma-affected joint. In osteochondral lesions, pain usually worsens with movement, but in osteoid osteoma, it is also seen during rest. Although there is a significant increase in accompanying synovial effusion secondary to synovitis, this is not remarkable in osteoid osteoma [10]. Osteochondral lesion of talus is seen in the posteromedial and anterolateral sides of talar bone. In the early stages, lesions might be more superficial and they are relatively parallel to the joint surface. Trauma etiology might be present and secondary cartilage damage, bone fractures or ligament injuries can also be seen in those cases. In late-stage disease, the detection of subcortical cyst formation, flattening of joint surfaces or intra-articular fragmentation in addition to the fluid accumulation in the space between talar bone and the surrounding OLT [11] are also common. In our cases, none of the localizations of detected lesions were typical for OLT. There were no previous trauma histories, uneven joint surface, and ligament or cartilage damage. In addition, there were nidus and dense dot appearances within the bone in CT images.

Intra-articular OO can also be misdiagnosed as osteoarthritis. However, in osteoarthritis (OA) cartilage damage, thinning, irregularities or misplaced flaps that involve both sides of the joint can be seen. Osteophyte formations, subchondral cysts and sclerosis are usually present [11]. Subchondral cysts seen in osteoarthritis might be confused with intra-articular OO but other radiological results that accompany osteoarthritis and clinical properties of the case are helpful in differential diagnosis.

Stress fractures are usually seen secondary to overuse of joints, especially in athletes. There can be accompanying muscle pathologies. The pain worsens with activity and decreases with rest [12]. In stress fractures, endosteal thickening and adjacent sclerosis caused by periosteal reaction rarely cause trouble for differential diagnosis; however, patient history, physical examination results and central dense dot appearance seen in intra-articular OO are helpful in the diagnosis of those cases.

Avascular necrosis (AVN) can be troublesome in some cases for diagnosing intra-articular OO in the hip joint. Predisposing factors can be seen in patients who develop femoral head avascular necrosis. AVN usually involves the anterior superior side of the femoral head. Collapse can be seen in such cases with progression of the condition. Cartilage loss is seen on the lesion during the early stage and as more diffuse

in late-stage cases [13]. In late-stage cases, subcortical lesions and surrounding sclerosis can be easily misinterpreted as intra-articular OO, however sclerosis has a serpiginous characteristic in those cases. In our cases, the absence of irregularities on the joint surface, placement of lesion and morphology and absence of typical patient history and clinical examination findings helped in the differential diagnosis of the case. Subchondral stress fractures seen on the femoral head are rarely confused with intra-articular OO due to lesion placement, morphology and patient history.

Although rare, intra-articular OO can also be misdiagnosed as a synovial disease. Synovium can be involved in systemic diseases such as rheumatoid arthritis, Lyme disease and Reiter's Syndrome. Systemic symptoms such as multiple joint involvement, fever and stiffness in the joints are important in differential diagnosis [14].

Intra-articular OO can be confused with monoarthritis. Inconclusive clinical and laboratory results, which do not support the diagnosis, the absence of narrowing of joint space and significant effusion, the absence of uniform chondrolysis and marginal osteophytes and a single-sided edema involvement all helped us during differential diagnosis [15,16].

Complete surgical excision of osteoid osteoma relieves the symptoms, but a partial excision causes symptoms to reappear with time [17]. Success rates of surgical excision vary between 88–100% [18]. Percutaneous CT-guided radiofrequency ablation therapy is a minimally invasive, safe and very reliable method and it is used in osteoid osteoma treatment with great success [18]. It is also the treatment of choice since it shows no significant complications or load-limiting following surgery [19]. The success rate of Percutaneous CT-guided radiofrequency ablation is reported to be between 70–100% [20]. A study of 71 patients treated with CT-guided radiofrequency ablation evaluated the recurrence of osteoid osteomas and found that 10 patients (14.1%) experienced recurrence at a median of 21.5 months after ablation. The predictive variables significantly associated with symptomatic recurrence were female sex, maximum tumor length, and an 'eccentricity index' (EI) of 3 or greater [21]. In our case series, no recurrence was observed during the follow-up period, which ranged from 8 to 18 months. Post-treatment imaging at follow-up demonstrated complete resolution of the lesions, and none of the patients reported persistent or recurrent symptoms.

In all three of our cases, pain ceased after RF ablation. RF ablation was preferred over surgical excision in these cases due to its minimally invasive nature, lower risk of complications, shorter hospital stay, and faster return to daily activities, which is particularly advantageous in lesions located in anatomically challenging or weight-bearing regions such as the talus [22,23]. The mean follow-up period for patients was 10 months and their control MRI/CT images showed no residual lesions. During follow-up, there were no clinical complaints or complications secondary to treatment. The patients went under full load after the treatment and they were not taken into physical therapy-rehabilitation programs. This was a retrospective study that was conducted using clinical data from Istanbul Medipol University Hospital, in accordance with institutional and national ethical standards and the Helsinki Declaration. Written informed consent was obtained from all patients for the

publication of their clinical data and images. The main limitation of our study is the small number of cases due to the rarity of this condition.

Intra-articular osteoid osteomas are relatively rare and often present with nonspecific symptoms such as joint effusion, pain, and restricted motion, which may mimic inflammatory arthritis or other joint disorders. As a result, delayed or incorrect diagnoses are common, highlighting the importance of considering IAOOs in the differential diagnosis of unexplained monoarticular joint pain, especially in younger patients [24]. Intra-articular osteoid osteoma should be kept in mind during differential diagnosis of the cases, especially the ones with atypical clinical and radiological findings and with suspected osteochondral lesions, aseptic osteonecrosis, monoarticular arthropathy or stress fractures.

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Ethics approval and consent to participate: This retrospective case series used anonymized data from routine clinical care. In line with institutional policy, formal ethical approval was not required. Written informed consent was obtained from all patients for publication. All procedures complied with the Declaration of Helsinki and its later amendments.

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