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Case Report

Osteoid osteoma of the femoral neck as a rare cause of hip pain in a 50-year-old male: A case report[☆]

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ABSTRACT

Osteoid osteoma (OO) is a benign osteoblastic tumor typically affecting young individuals. OO arising in the femoral neck is rare and may present with atypical clinical and radiological features, frequently leading to diagnostic delay. We report a case of a 50-year-old man with persistent hip pain for 8 months. Initial radiographs were unremarkable, and both magnetic resonance arthrography (MRA) and magnetic resonance imaging (MRI) demonstrated nonspecific bone marrow edema without identification of a nidus. Despite multiple clinical evaluations, including diagnostic injections and lumbar spine imaging, the patient's symptoms persisted. Computed tomography (CT) ultimately revealed a small nidus with central mineralization in the anteromedial region of the femoral neck. The diagnosis was confirmed histologically, and the patient was successfully treated with CT-guided radiofrequency ablation (RFA), resulting in complete symptom resolution. This case highlights the diagnostic challenges of OO in the femoral neck, particularly in older patients with atypical symptoms. MRI may obscure the nidus due to extensive bone marrow edema, emphasizing the importance of CT in cases of persistent focal bone marrow edema and inconclusive MRI findings.

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Introduction

Osteoid osteoma (OO) is a benign osteoblastic tumor first described in 1935 by Jaffe [1]. It is characterized by a small, central

mineralization, called a nidus, surrounded by varying degrees of reactive sclerotic bone formation. The lesion typically arises in the diaphyseal cortex of long bones and rarely exceeds 1.5 cm in size [2–6]. OO accounts for approximately 10% of all benign bone tumors and most commonly affects children

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and young adults between 10 and 30 years of age [2–6]. Clinically, OO typically presents with localized pain that worsens at night and demonstrates a marked response to nonsteroidal anti-inflammatory drugs (NSAIDs), owing to high intralesional concentrations of prostaglandins and increased expression of cyclooxygenase-2 within the nidus [2,3].

In the vast majority of cases, conventional radiographs demonstrate the classic appearance of a radiolucent nidus with central mineralization surrounded by reactive sclerosis [7].

However, in anatomically complex locations or atypical presentations, computed tomography (CT) is considered the imaging modality of choice, as it can accurately identify the nidus and distinguish it from the surrounding trabecular bone, even in the absence of reactive sclerosis. Magnetic resonance imaging (MRI) may serve as a complementary imaging modality but can occasionally obscure the nidus because of extensive surrounding bone marrow edema [7–11].

In approximately 5% of cases, OO arises in an intra- or juxta-articular location in the femoral neck, resulting in substantial diagnostic challenges. In these cases, conventional radiographs are frequently unremarkable due to the absence of pronounced reactive sclerosis, while MRI often demonstrates synovitis and bone marrow edema, obscuring the nidus and mimic more prevalent articular pathologies, such as osteoarthritis or inflammatory rheumatic disease, thereby contributing to diagnostic delay [6,8–15]. The diagnostic challenge may be further amplified in older patients where OO is rare, and alternative diagnoses are statistically more likely, increasing the risk of delayed or missed diagnosis.

Due to prominent response to NSAIDs, OO can sometimes be managed with conservative treatment; however, regression is often slow requiring long therapy with NSAIDs, often not tolerated for longer periods—especially in the adult population [16,17]. Surgical options for osteoid osteoma include CT-guided percutaneous techniques; most commonly radiofrequency ablation (RFA) as well as CT-guided percutaneous excision and, less frequently, open resection [18]. In selected intra-articular cases, arthroscopy-assisted ablation or excision may be employed to allow direct visualization and minimize the risk of chondral injury [19].

CT-guided RFA has become the treatment modality of choice due to its minimally invasive nature, high primary success rates, low complication rates, and rapid postoperative pain relief [20]. Compared with open surgical resection, percutaneous techniques are associated with shorter hospital stay, faster functional recovery, and reduced structural weakening of the affected bone [21–24].

Case presentation

A 50-year-old Danish male with a prior medical history of conservatively managed left medial meniscus injury and otherwise unremarkable medical history with no regular medication, was referred to the orthopedic clinic with an 8-month history of right groin and anterior thigh pain without preceding trauma.

Prior to referral, the patient had been evaluated by his general practitioner and completed a 6-week course of physiotherapy without clinical improvement. During physiotherapy assessment, femoroacetabular impingement (cam and pincer morphology) was suspected on ultrasound, prompting referral to an orthopedic specialist.

At the time of initial consultation, the patient was using paracetamol and NSAIDs on a daily basis for pain control. The patient later reported that NSAID use had provided significant symptomatic relief with minimal effect from paracetamol. There was no clear history of nocturnal pain exacerbation.

Standard radiographs of the pelvis and hip were without radiographic abnormalities (Fig. 1). Clinical examination demonstrated near full and largely painless range of motion, with preserved flexion and extension and approximately 30° of both internal and external rotation. FABER and Lasègue's tests were negative. The only positive clinical finding was a positive impingement test, raising suspicion of acetabular labral pathology.

Consequently, the patient was referred for magnetic resonance arthrography (MRA) of the hip. MRA is primarily tailored to the evaluation of labral pathology and therefore relies predominantly on anatomically oriented T1-weighted fat-suppressed sequences, particularly following intra-articular contrast administration, making the detection of bone marrow edema challenging. In the present case, the MRA protocol included only a single proton density-weighted fat-suppressed sequence, which demonstrated non-specific bone marrow edema in the anterior aspect of the femoral neck (Fig. 2).

Since T1-weighted fat saturated sequences did not reveal any labral tears and in the absence of definitive findings, the patient was subsequently referred back to his primary care physician for further management.

Two months later, due to persistent symptoms without clinical improvement, the patient was referred to a sports medicine clinic for further evaluation. Femoroacetabular impingement involving the hip flexor region was considered, and a diagnostic extra-articular corticosteroid injection was administered. In parallel, magnetic resonance imaging of the lumbar spine was performed to exclude referred pain of spinal origin.

Lumbar spine MRI was unremarkable, and the corticosteroid injection did not result in symptom relief. The case was subsequently re-evaluated in a multidisciplinary discussion between the orthopedic and radiology departments. Given the focal bone marrow edema identified on the single proton density-weighted sequence of the prior MR arthrography, a dedicated non-contrast MRI of the hip was requested.

This examination demonstrated pronounced subcortical bone marrow edema at the level of the anterior capsular attachment of the femoral neck, with associated subtle cortical irregularity (Fig. 3).

In addition, there was marked periosteal elevation with associated subperiosteal fluid collection and reactive changes in the surrounding soft tissues—raising suspicion of a subperiosteal OO and a further non-contrast CT was requested, showing a 5–6 mm nidus in the distal part of the femoral

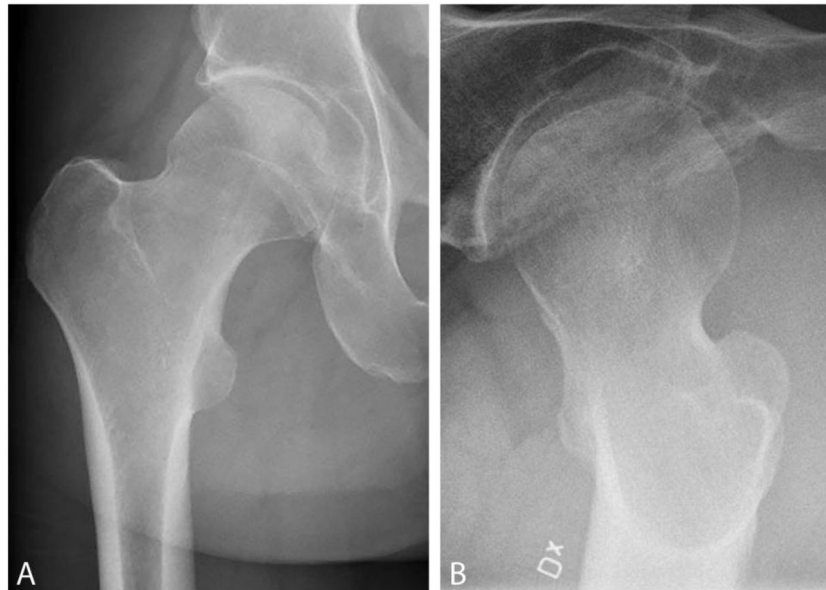


Fig. 1 – Plain radiographs of the right hip in anteroposterior (A) and 90° Dunn views (B) showing no radiographic abnormality.

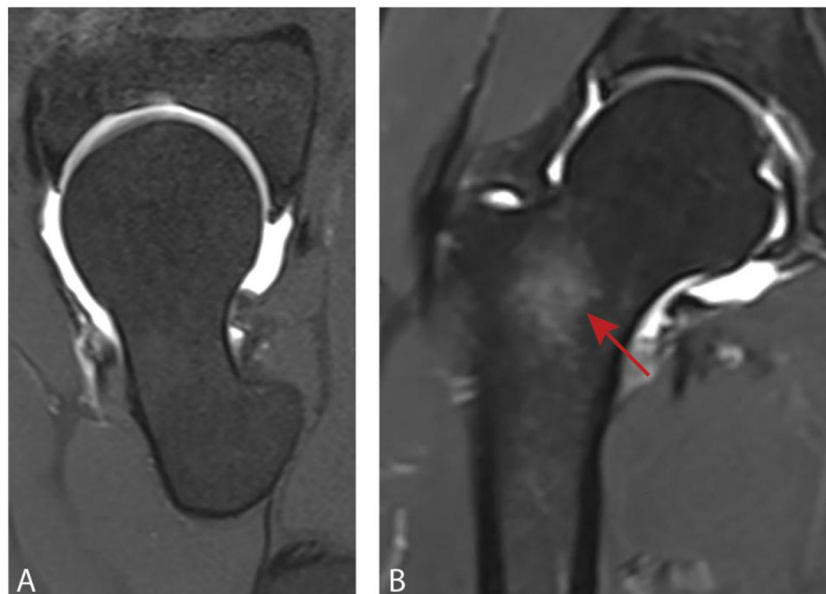


Fig. 2 – MRA demonstrating an axial T1-weighted fat-suppressed sequence (A) without a definite labral lesion, and a coronal proton density-weighted fat-suppressed sequence (B) showing focal nonspecific bone marrow edema in the anterior aspect of the femoral neck (arrow).

neck with central mineralization without surrounding sclerosis and only subtle periosteal reaction (Fig. 4).

The patient's case was discussed at a multidisciplinary team conference, and CT-guided biopsy with simultaneous CT-guided radiofrequency ablation (RFA) was offered.

Under general anesthesia and using an anterior approach, a 16G Bonoptoy introducer system was advanced into the lesion under CT guidance. Subsequently, an 18G Bonoptoy biopsy needle was used to obtain 2 core biopsy specimens, together with

a coagulated sample, for histopathological analysis. Through the same introducer, a Covidien Cool-tip RF ablation antenna was positioned centrally within the lesion, and RFA was performed at 90°C for 6 minutes.

Following a cooling period, the antenna and introducer were removed. No immediate, early, or late complications were observed.

Following restriction of physical activity for 3 months, the patient became pain-free and rapidly returned to his pre-symptom activity level.

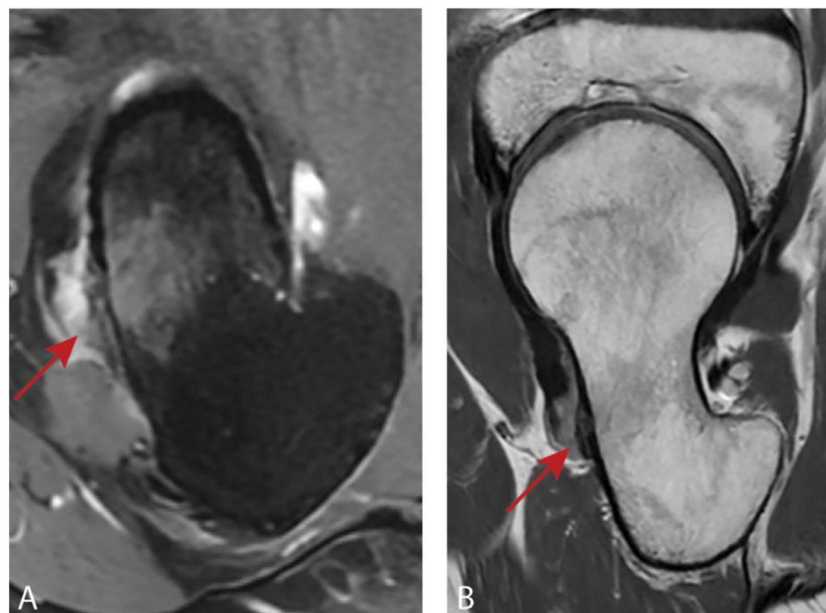


Fig. 3 – Noncontrast MRI demonstrating localized bone marrow edema, periosteal elevation, and reactive changes in the surrounding soft tissues on axial fat-suppressed proton density-weighted sequences (A) at the anterior aspect of the femoral neck (arrow). The corresponding non-fat-suppressed sequence (B) shows the lesion localized in a subperiosteal location (arrow).

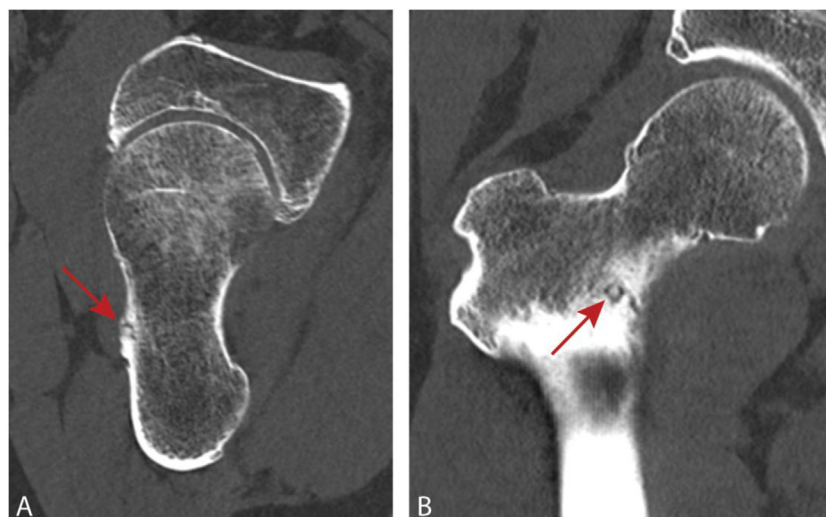


Fig. 4 – Reconstructed images from non-contrast enhanced CT of the right hip showing a nidus in the anterior medial aspect of the distal femoral neck (arrows) on reconstructed axial (A) and coronal (B) sequences.

Although the coagulated sample was insufficient for definitive microscopic assessment, histopathological examination of the biopsy specimens demonstrated a nidus-like lesion composed of anastomosing trabeculae of immature woven bone lined by osteoblasts. The intervening stroma consisted of highly vascular connective tissue. Immunohistochemical analysis showed negative staining for pancytok-

eratin and SOX10. Only a few CD45-positive hematopoietic cells were identified within the vascularized connective tissue (Fig. 5).

Overall, the morphological, histological, and immunohistochemical findings were consistent with both osteoid osteoma and osteoblastoma. Although osteoblastoma was considered in the histopathological differential diagnosis, the small le-

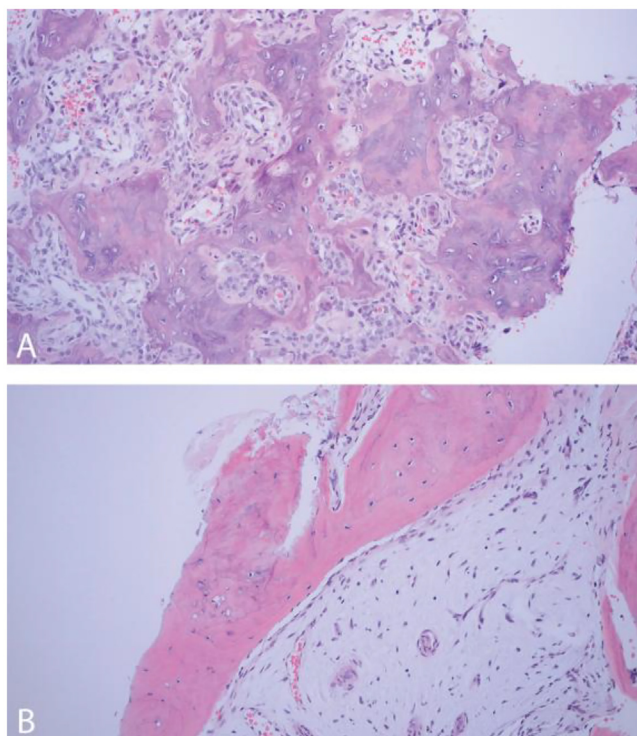


Fig. 5 – Histopathology at 100x magnification demonstrating anastomosing trabeculae of immature woven bone lined by osteoblasts with intervening highly vascular connective tissue stroma (A), and focal sclerotic bone formation (B).

sion size, characteristic clinical presentation with marked NSAID responsiveness, and typical CT appearance of a nidus supported the diagnosis of osteoid osteoma.

Discussion

Diagnosing OO is often straightforward when the characteristic clinical presentation is accompanied by classic radiographic findings. However, OO of the femoral neck frequently lacks these typical clinical and radiographic features, and symptoms may therefore be more subtle or atypical. This diagnostic difficulty is further compounded when OO occurs at an atypical age. OO is most commonly seen in children and adolescents but is rare in older adults, in whom alternative diagnoses—such as degenerative joint disease and other more prevalent pathologies—are more likely. Consequently, establishing the correct diagnosis in this patient population is often more challenging [6].

To our knowledge, only 2 well-documented cases of OO involving the femoral neck in patients older than 50 years have been reported in the literature. The first case involved a 53-year-old female with recurrent OO of the femoral neck [25]. Prior to the initial diagnosis, there was a 3-year diagnostic delay during which she was managed for muscle strain, tendinitis, and greater trochanteric bursitis. After diagnosis, she was

initially treated with percutaneous CT-guided radiofrequency ablation; however, symptoms recurred 6 months later. Follow-up CT demonstrated a new nidus at the same anatomical location. The lesion was subsequently managed with open en bloc resection and internal fixation using a dynamic hip screw.

A similar diagnostic challenge was described in a 59-year-old male with OO of the femoral neck. In that case, initial radiographs were normal, and MRI demonstrated prominent bone marrow edema that obscured the nidus, resulting in a prolonged diagnostic delay. Ultimately, CT revealed the nidus, and the patient was treated successfully with CT-guided RFA. A biopsy was taken, but the results are unfortunately not included in the case report—although the results are most likely in the line with the case reports' conclusion [26].

These findings highlight the limitations of MRI in detecting osteoid osteoma in an intra- or juxta-articular location of the femoral neck, due to the absence or minimal presence of a sclerotic rim as well as surrounding bone marrow edema obscuring the nidus.

In our case, initial conventional radiographs of the hip were unremarkable. MRA and conventional MRI demonstrated bone marrow edema without clear visualization of a nidus – a classic pitfall in OO of the femoral neck. In contrast, CT clearly demonstrated the characteristic nidus within the femoral neck, thereby supporting the suspected diagnosis.

In a middle-aged patient presenting with focal femoral neck bone marrow edema, relevant differential diagnoses for bone marrow edema in the femoral neck include stress fracture, transient osteoporosis of the hip, femoroacetabular impingement-related subchondral stress reaction, early osteoarthritis, and inflammatory arthropathy. Less commonly, infection and neoplastic processes such as metastasis or primary bone tumors should also be considered [6,11].

In the present case, the limited use of fluid-sensitive sequences in the MRA protocol may have contributed to the failure to detect the lesion sooner. Furthermore, a thorough clinical history revealing the marked pain-relief when taking NSAID, but not paracetamol, might have raised the suspicion of OO at an earlier time. Overall, this emphasizes the importance of a broad diagnostic approach in adult patients presenting with atypical hip pain and the use of CT in cases of persistent, focal bone marrow edema, particularly where MRI findings are inconclusive.

Both previously mentioned published cases underwent CT-guided RFA, with variable treatment outcomes reported. Generally, RFA is effective with an overall success rate of 93% and only 2.3% complications in adults [27]. However, care should be taken when performing RFA as too much heat or wrong placement of the antenna can lead to unwanted osteonecrosis—which was not the case in either of the cases [25,26].

In summary, we believe that our case is particularly valuable due to the complete documentation of the diagnostic pathway, from initial symptom presentation to final diagnosis, incorporating multimodal imaging, histopathological examination, and definitive treatment with radiofrequency ablation. Thus, highlighting the great clinical and diagnostic challenges that OO of the femoral neck present and raising awareness of the need for a broad diagnostic approach in older patients with atypical hip pain and persistent, focal bone marrow edema.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work, the authors used OpenAI ChatGPT in order to enhance language and readability. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

Patient consent

Written informed consent for publication of this case and associated images was obtained from the patient. A copy of the consent is retained by the authors and is available for review upon request.

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