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A rare case of osteoblastoma in the femoral head combined with cam-type femoroacetabular impingement: A case report

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Abstract

Osteoblastoma is a relatively rare benign bone-forming tumor accounting for less than 1% of all bone tumors. This report describes a patient with an osteoblastoma in the femoral head complicated by coexistence of femoroacetabular impingement. A 25-year-old male rugby football player complained of severe right hip pain after an injury during rugby practice. The pain became progressively worse despite resting from sports activity and rehabilitation for 4 months. The image inspection revealed bone tumor complicated by cam-type femoroacetabular impingement and a labral injury. Hip arthroscopic surgery was planned using a navigation system and a three-dimensional model for both complete debridement and cam resection. The tumor was resected by open surgery using a posterior approach. The bone tumor was diagnosed histopathologically as an osteoblastoma. The patient's symptoms improved markedly after surgery, with no evidence of local tumor recurrence or hip arthritis 1 year later.

Keywords

Osteoblastoma, femoroacetabular impingement, arthroscopic surgery, case report

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Introduction

Osteoblastoma is a bone-forming tumor that occurs most frequently in male adolescents; it accounts for <1% of all bone tumors.[1–3] The histopathological features of osteoblastoma are similar to those of osteoid osteoma. Osteoblastoma can occur in any skeletal region, but is more common in the spine, sacrum, femur, jaw, feet, tibia, and fibula.[4] Thus, interarticular osteoblastoma is quite rare. Typical symptoms of interarticular osteoblastoma include progressive hip pain with severe synovitis, particularly in patients with tumor localization at the surface of the joints. Standard treatments include curettage and resection; however, osteoblastoma can be locally aggressive and recur following curettage.[1]

Femoroacetabular impingement (FAI) is a type of bone morphology associated with mechanical hip impingement, resulting in secondary osteoarthritis.[5] Cam-type FAI is caused by morphological abnormalities of the femoral head and neck transition, typically in patients who participate frequently in sports. Arthroscopic surgery is an effective option for FAI with refractory pain. Although several reports describe bone tumors combined with FAI,[5–7] co-occurrence of intra-articular osteoblastoma and FAI is quite rare. Diagnosis of these patients requires careful consideration of clinical symptoms and clinical history, as well as physical and imaging findings.

This report describes a patient with osteoblastoma in the posterior region of the femoral head with synovitis of the hip, combined with cam-type FAI resulting from sports activity. The patient was treated successfully by arthroscopic cam resection and open tumor resection.

Case report

A 25-year-old man injured his hip joint during rugby practice. He presented at our hospital complaining of severe right hip pain. He had been playing rugby since he was a junior

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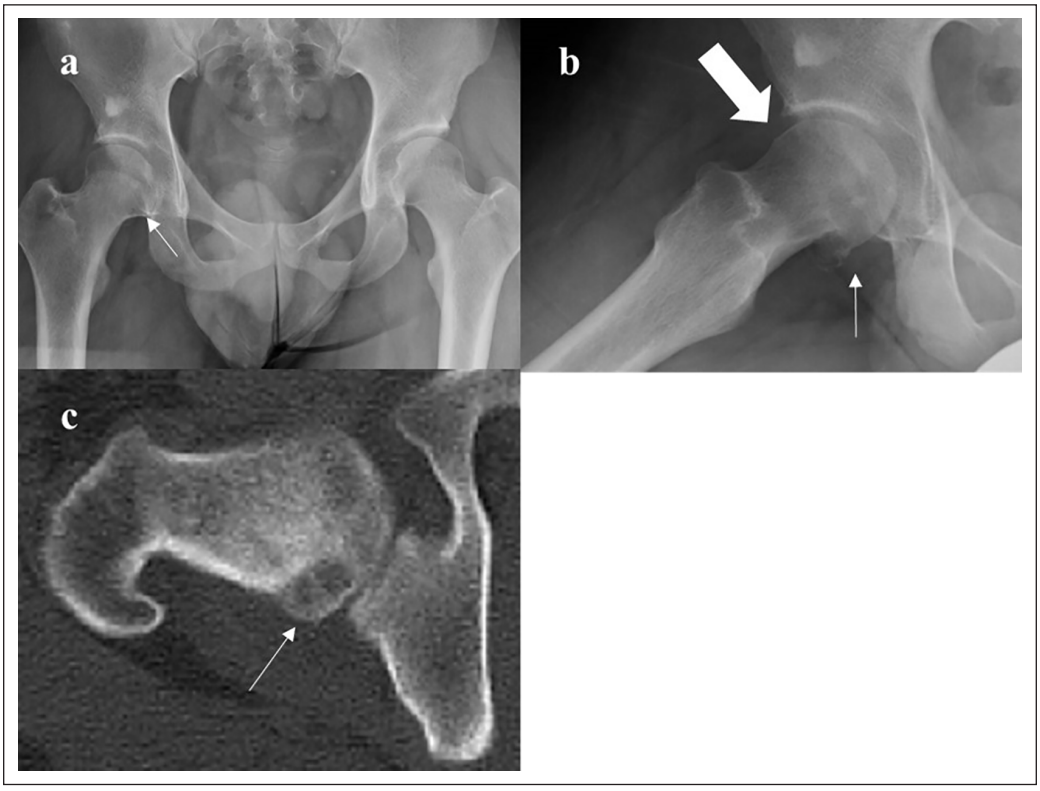

Figure 1. Pre-operative image: (a) anteroposterior view of the right hip joint showing a center edge angle of 30°, but no developmental dysplasia of the right hip. (b) Dunn view, showing a prominent bony bump (thick arrow) on the right femoral neck and findings of bone transparency (thin arrow) in the posterior areas of the femoral head. (c) CT scan, showing a tumor-like lesion (2.0 cm × 1.5 cm in size) located in the posterior area of the femoral head. The axial image shows a lesion with small central foci of mineralized matrix, without sclerotic margins and accompanied by cortical erosion and periosteal reaction.

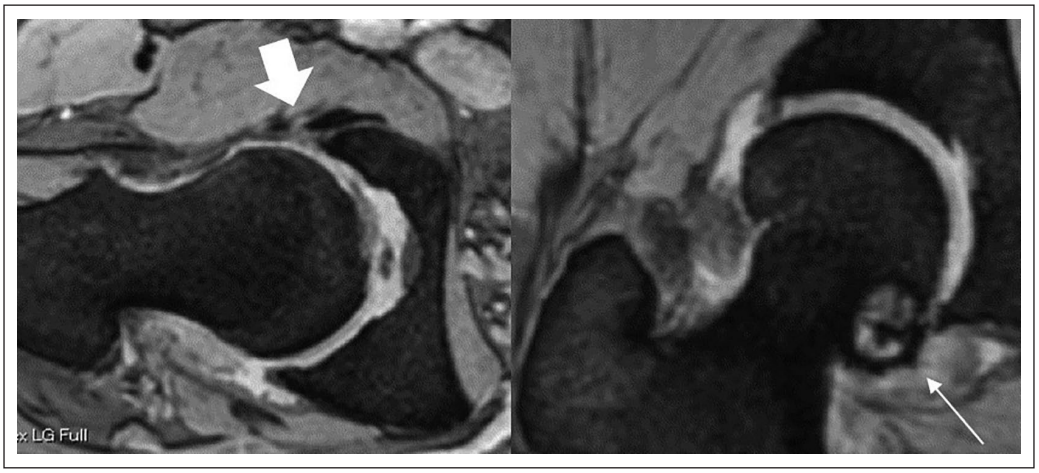

Figure 2. Pre-operative multiple echo recombined gradient echo (MERGE) MRI showing an anterior labral tear injury (thick arrow) and a bone tumor (thin arrow) behind the femoral head.

high school student. Despite ceasing sports activities and rehabilitation for 4 months, his symptoms worsened and he began to experience pain at night. Plain radiographs revealed a radiolucent lesion in the posterior femoral head and cam morphology, with an increased α angle (64°) (Figure 1(a) and (b)). Physical examination revealed a limping gait and limited range of motion (flexion 100°) of the right hip joint. Flexion Adduction Internal Rotation (FADDIR) test was positive on the right but Flexion Abduction External Rotation (FABER) test was negative. Computed tomography (CT) showed a tumor located in the posterior region of the femoral head (Figure 1(c)). Magnetic resonance imaging (MRI) revealed an apparently non-malignant tumor on the posterior femoral head, as well as a labrum injury (Figure 2). Based on

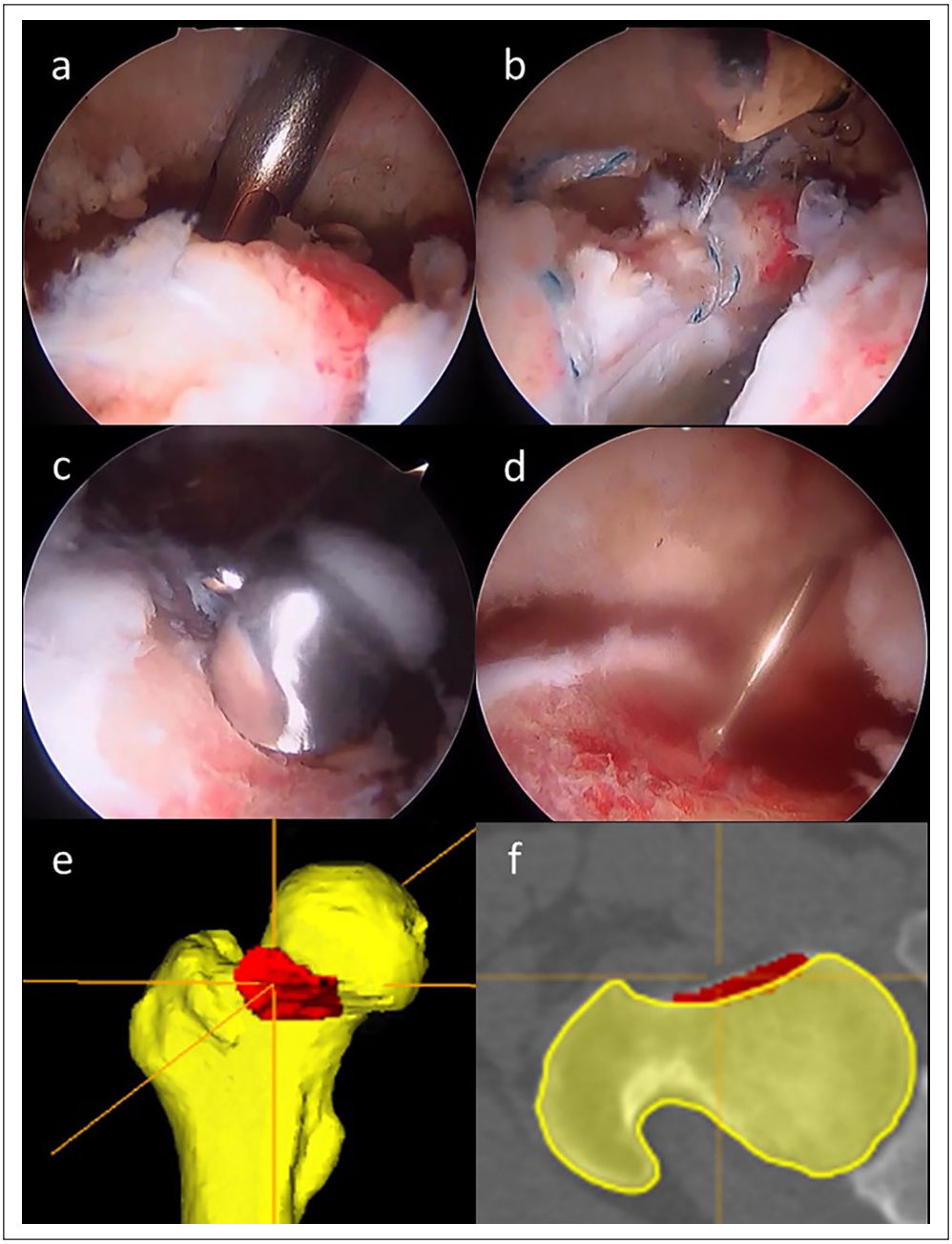

Figure 3. Hip arthroscopic findings. (a) Synovial hyperplasia was observed in the joint. The labrum was inflamed and thickened, with a complete tear (according to the Mahorn classification). (b) Repair of the labrum with two anchors by a round loop suture. (c) Exposure of cancellous bone around the cam lesion from the femoral neck to the head, followed by resection under computer-navigated guidance. (d), (e), and (f) Planned resection range (red areas). Cam resection was performed under computer-navigated assistance.

these clinical and imaging findings, the patient was diagnosed with some type of benign bone tumor at the posterior region of the femoral head, combined with cam-type FAI and labral injury.

Pre-operative planning used ZedHip (Lexi, Tokyo, Japan) for impingement simulation analysis, followed by a virtual osteochondroplasty. The planned three-dimensional model was transferred to the navigation system (Orthomap 3D; Stryker, Kalamazoo, MI, USA). Computer-assisted hip arthroscopic surgery was performed as described.[8] Briefly, the patient was placed in the supine position and two portals, an anterolateral and a mid-anterior portal, were made to access the hip joint under traction. The tracker device was set on the distal femur using two pins and fluoroscopic-guided point registration was performed; this revealed a labral tear accompanied by severe synovitis and synovial hyperplasia in the hip joint (Figure 3). Following labrum repair and debridement of synovitis, traction was released and the cam lesion

was exposed. During osteochondroplasty, the area and depth of the resected section were monitored and evaluated in real time by the computer (Figure 3(d)–(f)). After arthroscopic surgery, the tumor was resected using a posterior approach (Figure 4).

Histopathological examination revealed reticular osteoid and fibrous bone formation, transitioning to thickened trabeculae at the periphery. The osteoid was surrounded by plasmacytoid or epithelioid osteoblasts composed of irregular trabecular bone (Figure 5). Based on these histopathological features, the bone tumor was diagnosed as an osteoblastoma.

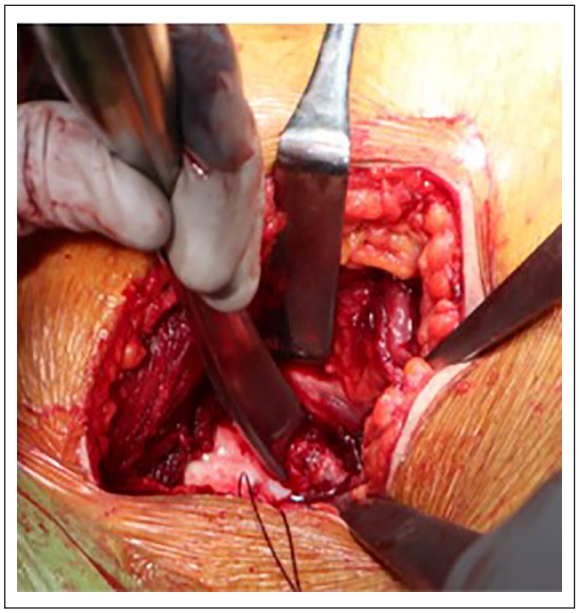

Figure 4. The tumor was resected with an en block specimen by posterior approach.

On Day 1 post-surgery, the patient was started on non-weight-bearing and motion exercises using continuous passive. Full weight-bearing was permitted 4 weeks after the operation. Removal of the cam lesion and bone tumor was confirmed by post-operative radiography and CT scanning (Figure 6). The patient gradually returned to rugby practice 3 months after surgery and started participating in the game after 1 year. At 1 year post-surgery, flexion was 110°. His Modified Harris Hip Score[9] improved from 67 to 95 and his Non-Arthritic Hip Score[10] improved from 61 to 94.

Discussion

Osteoblastoma is a rare benign bone tumor histologically similar to osteoid osteoma; however, the two entities can be distinguished once they reach >2–3 cm in diameter.[1,2] Osteoblastoma and osteoid osteoma are two distinct entities based on clinical and histopathological features.[2,11] Osteoid osteoma arises in the long bones, whereas osteoblastoma is more likely to occur in the axial skeleton.[11] Symptoms of osteoblastoma include chronic pain that does not increase at night and, unlike osteoid osteoma, is not improved by treatment with non-steroidal anti-inflammatory agents.[1,2,11] Unlike scans of patients with osteoid osteoma, plain X-ray and CT scans of patients with osteoblastoma show local osteolytic lesions surrounding unclear areas of sclerosis. MRI shows nidus and inflammatory changes around the tumor, such as bone marrow edema or synovitis. However, these typical imaging features of intra-articular tumors are difficult to detect. Bone marrow and soft-tissue edema and joint effusions in MRI are useful for differential diagnosis.[12,13] Inflammatory changes and pain are related to prostaglandins and other chemical mediators secreted by the nidus.[3,4,11] The rate of local

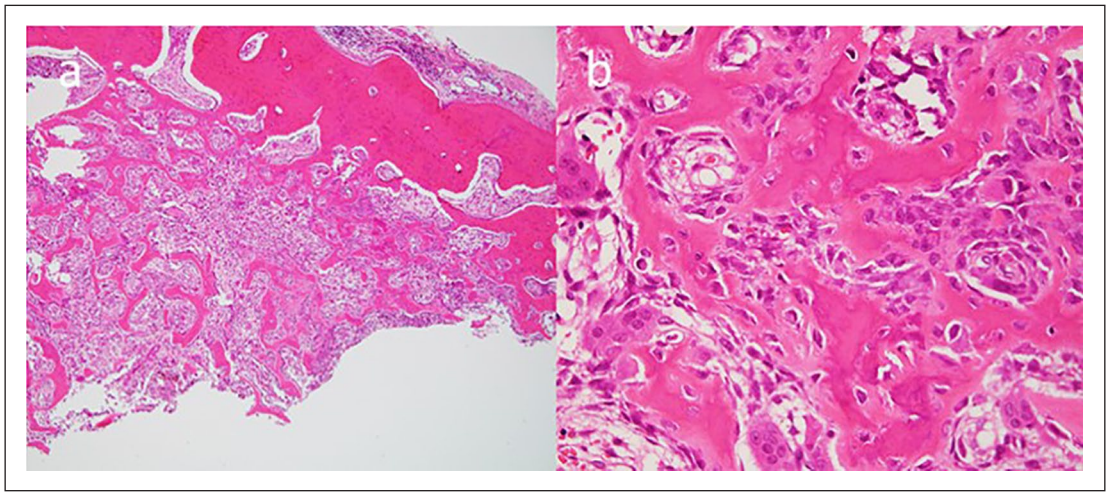

Figure 5. Pathological findings. (a) Low-power view, showing that the tumor consisted of reticular woven bone mixed with osteoid. The lesion was surrounded by sclerotic bone. (b) High-power view, showing that the reticular woven bone and osteoid were surrounded by osteoblasts without nuclear atypia. Osteoclast-like giant cells were also observed.

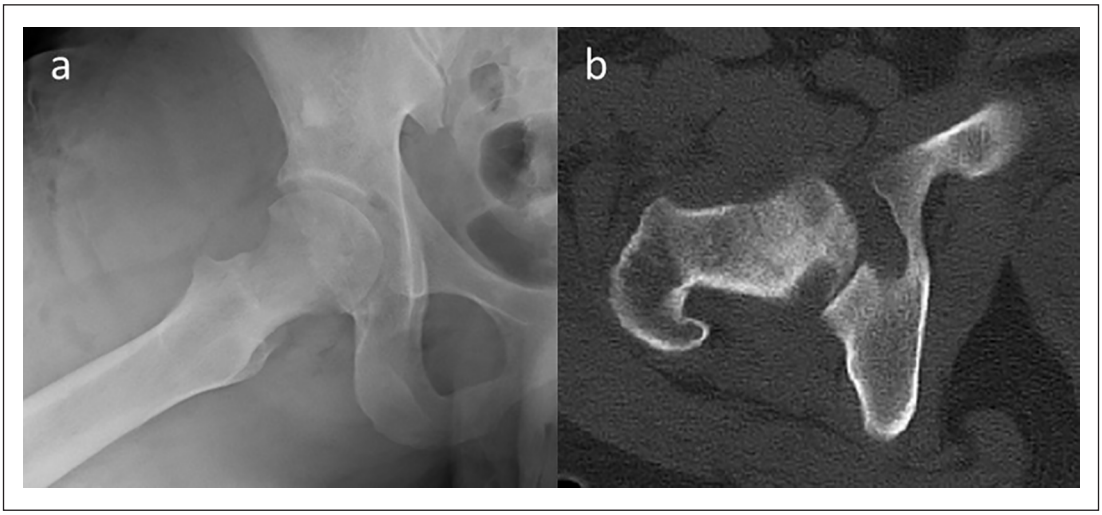

Figure 6. Post-operative (a) plain X-ray and (b) CT images, confirming that the cam lesion on the anterior femoral neck and the tumor on the posterior femoral head had been resected completely.

recurrence following intralesional curettage and packing is approximately 24%.[4] Although 43% of femoral tumors recur after surgery, recurrence in selected patients can be minimized by en bloc resection.

Osteoid osteoma combined with FAI in the hip joint,[5–7] as well as osteoblastoma in the hip joint that cause an atypical hip pain,[14] has been reported. However, in most cases, intra-articular osteoblastoma localizes to the acetabulum.[3,4] The patient's past history, which included high participation in sports activity, along with the results of plain radiographs, suggested that he had a typical cam-type FAI. However, persistive severe night pain, as observed in our patient, is not a typical symptom of FAI. These findings highlight the importance of considering existing disorders other than FAI that cause hip pain. Severe synovial inflammation spreading into parts of the intra-articular space (an atypical finding on arthroscopy) was also atypical of FAI. It was reasonable option to perform debridement through arthroscopy for remission of synovitis.

A previous report described two patients who experienced progressive FAI after complete excision of osteoid osteomas, suggesting that tumor resection alone may result in progression of cam lesions.[6] Alternatively, tumors may remain microscopic in size, suggesting that a combination of reliable cam resection and tumor resection should be performed. Our patient initially underwent arthroscopic surgery for labrum repair with synovial debridement, followed by cam resection under navigation assistance. Subsequently, he underwent tumor resection via a posterior approach. It was essential to perform hip arthroscopy for cam resection and to suture the labrum, particularly to debride the inflammatory widespread interarticular synovium completely. By contrast, the bone tumor was resected by open surgery. It was important to submit a biopsy with an en block specimen. Furthermore, the tumor location was difficult to approach arthroscopically. Therefore, coexistence of osteoblastoma combined with typical FAI required complicated treatment that needed additional open surgery after hip arthroscopy. Although long-term follow-up is needed, tumor recurrence is less likely after an open rather than an arthroscopic approach. Thus, the combination of arthroscopic and open surgery was a reasonable option for this patient.

Conclusion

We encountered a patient with a rare case of osteoblastoma in the posterior femoral head combined with a cam-type FAI. The patient underwent surgery via two approaches: arthroscopic surgery for the FAI and interarticular synovitis and open surgery for the osteoblastoma. Surgery was successful and resulted in a favorable clinical outcome.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

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Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

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