J Prima Med Sains (2025) 7(2):135-138
doi.org/10.34012/jpms.v7i2.6773

CASE REPORT

Magnetic resonance imaging enhances the diagnosis of intra-articular osteochondroma in normal plain radiography

Dewi Asih*, Fransiskus Aryo Pratomo

ABSTRACT

Osteochondroma accounts for 10%–15% of primary bone tumors and typically develops extra-articularly from the metaphysis of long bones. However, its intra-articular occurrence presents substantial diagnostic challenges, particularly in radiologic evaluation. This report describes a 27-year-old man with a six-month history of left knee pain without prior trauma. Physical examination revealed no abnormalities, and laboratory parameters were within normal limits. Plain radiographs showed no detectable abnormalities and were interpreted as normal. In contrast, magnetic resonance imaging (MRI) demonstrated a distinct intra-articular lesion in the distal femoral intercondylar fossa, characterized by low signal intensity on T1-weighted images, high signal intensity on T2-weighted images, continuity with the epiphyseal bone, and preservation of a stalk, findings consistent with osteochondroma. Evidence of anterior cruciate ligament (ACL) impingement was also noted, but no features suggestive of malignant transformation were identified. The final diagnosis confirmed the presence of an intra-articular osteochondroma of the knee, verified by arthroscopic evaluation and histopathological examination. This case highlights the limitations of plain radiography for diagnosing intra-articular osteochondroma and emphasizes the essential role of MRI in establishing an accurate diagnosis and guiding appropriate management.

Keywords: bone neoplasm, intra-articular osteochondroma, osteochondroma, tumor

INTRODUCTION

Osteochondroma (OC) is a common benign tumor composed of bone and cartilage tissue. It typically develops near the metaphyseal regions of long bones, outside the joint spaces. Osteochondroma represents the most frequent benign bone tumor, accounting for 10–15% of all bone neoplasms.[1] The estimated incidence is approximately 1 in 50,000 individuals, with a predilection for the second decade of life and a male-to-female ratio of about 3:1.[2] The most commonly affected sites include the proximal humerus, proximal tibia, and distal femur.[3] These lesions are classified as either pedunculated or sessile, with the pedunculated form being more prevalent.[1]

Although less frequent, osteochondromas can also occur in adults, representing about 25% of cases diagnosed after the age of 20[2], and may arise in atypical locations, including intra-articular regions.[4] This study describes a rare case of intra-articular osteochondroma of the left knee, emphasizing the corresponding radiologic features.

CASE REPORT

A 27-year-old male presented with persistent left knee pain lasting for six months, without any history of trauma. The pain worsened with physical activity, improved with rest, and was absent at night. The patient also reported a progressively limited range of knee motion that significantly interfered with daily activities.

Physical examination revealed restricted active and passive knee extension, while muscle strength remained intact, with symmetric grade 5/5 strength in both lower extremities. Laboratory evaluations, including complete blood count, erythrocyte sedimentation rate, C-reactive protein, renal function tests, and electrolytes, were all within normal limits. Initial radiographs showed no visible abnormalities (Figure 1).

Affiliation
Department of Radiology, Universitas Prima Indonesia, Medan, Indonesia

Correspondence
dewi_wirasasmita@yahoo.com

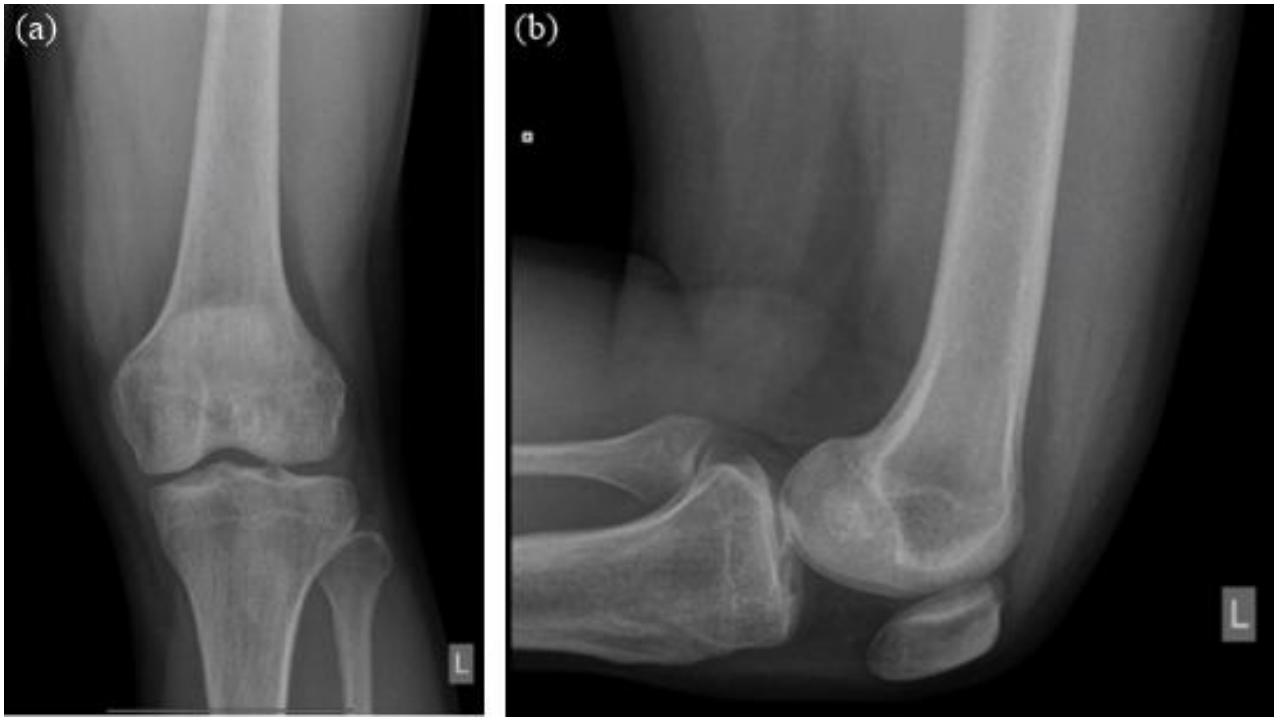

Figure 1. Radiograph (a, anteroposterior; b, lateral) of the left knee showing no apparent abnormalities.

Magnetic resonance imaging (MRI) of the knee demonstrated an intra-articular lesion in the distal femoral intercondylar fossa. Sagittal proton density (PD) and coronal PD sequences (Figure 2) showed a lesion with bone-like signal intensity that was continuous with the distal femoral epiphysis. Axial sequences (Figure 3) further delineated this continuity, showing an intact stalk consistent with the characteristics of an osteochondroma, accompanied by anterior cruciate ligament (ACL) impingement but without evidence of malignancy.

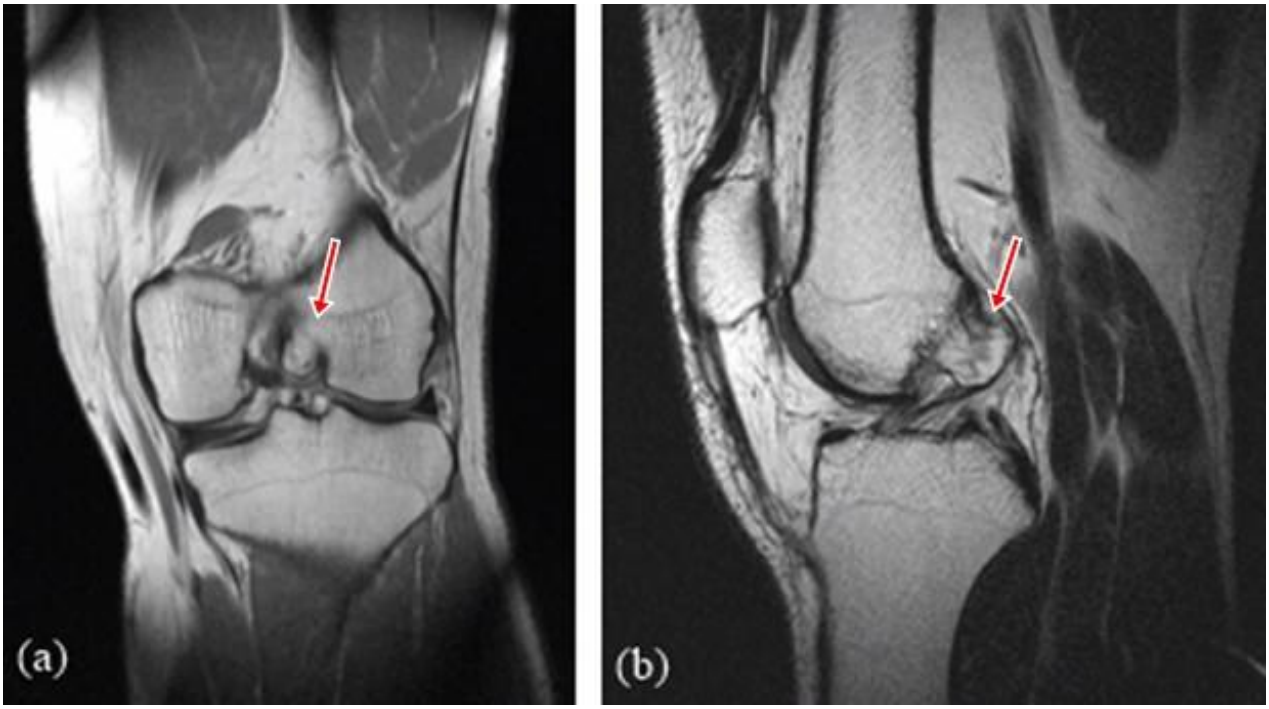

Figure 2. Magnetic resonance images (a, sagittal PD; b, coronal PD) showing an intra-articular lesion with bone signal intensity continuous with the distal femoral epiphysis (red arrow).

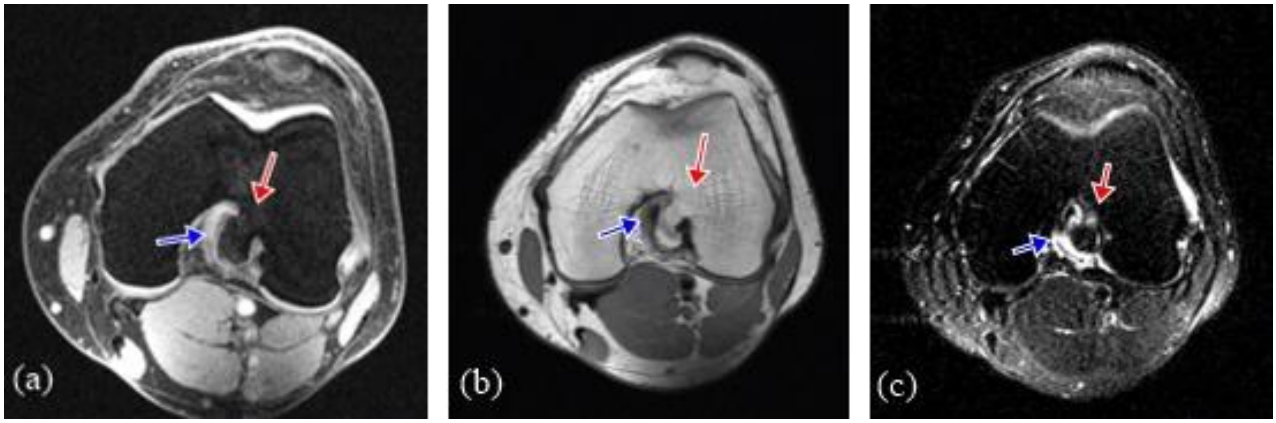

Figure 3. Axial magnetic resonance images (a, T2; b, PD; c, 3D SPGR FS) showing an intact stalk of the lesion (red arrow) and ACL impingement (blue arrow)

The patient underwent arthroscopic resection of the mass. Histopathologic examination confirmed that the lesion consisted of bone formed through endochondral ossification, covered by a layer of hyaline cartilage without significant chondrocyte atypia, confirming the diagnosis of osteochondroma.

DISCUSSION

Osteochondroma is one of the most common benign bone tumors. The defining feature of this lesion is a cartilage cap covering both the cortex and the medullary canal of the underlying bone. Although the exact mechanism of osteochondroma development remains unclear, current theories suggest that the periosteum contributes to its formation by generating chondroblasts and osteoblasts because of its regenerative potential. This case highlights the essential role of MRI in diagnosing complex intra-articular osteochondromas and emphasizes its importance in effective clinical management. Regarding the patient's age, most cases are diagnosed between 8 and 12 years[1], although approximately 25% occur after the age of 20.[2] Osteochondroma affects males more frequently, with a male-to-female ratio of 3:1.[2] This predominance may influence diagnostic approaches and management strategies. However, the true incidence of osteochondroma remains unknown because many cases are asymptomatic and therefore undiagnosed.

Apart from solitary osteochondroma, which accounts for approximately 85% of all cases, the remaining 15% represent hereditary multiple exostoses (HME), an autosomal dominant condition. A family history is found in about 65% of cases, typically diagnosed within the first decade of life and occurring more frequently in males.[5] Regarding lesion location, the tibia, femur, and fibula are the most common sites, with lesions on the left side of the body being more frequent.[3] Nevertheless, osteochondroma can also occur in other bones, including intra-articular sites such as the knee[4], elbow[6], mandible[7], and scapula[8].

In general, osteochondroma is asymptomatic but can cause complications such as local pain, swelling, peripheral nerve compression, thrombosis, aneurysm formation, or fractures. The most serious complication is malignant transformation into chondrosarcoma.[9] For diagnosis, simple radiography is often the initial step and may be sufficient when the irregular cortex of the lesion is visibly continuous with the adjacent cortical bone. However, radiography has limitations, particularly when lesion features are indistinct. In such cases, advanced imaging techniques such as MRI are required. Typical radiographic features of osteochondroma include cortical and medullary continuity with the parent bone and a cartilage cap. The lesion may be sessile or pedunculated, with pedunculated types generally extending away from the joint.[10]

CT and MRI provide superior lesion characterization, especially when radiographic findings raise suspicion for malignant transformation. On MRI, the cartilage cap demonstrates intermediate to high signal intensity on T2-weighted and proton density (PD) sequences. A cartilage cap thickness greater than 20 mm may indicate potential malignancy. MRI is also valuable for identifying complications such as a bursa overlying the lesion, which appears as a hyperintense fluid collection on T2-weighted and PD images, with or without evidence of bursitis. Moreover, MRI can assess neurovascular involvement, including displacement, impingement, or hyperintense T2/PD signals in affected nerves, as well as evaluate surrounding tissues such as cartilage, muscles, ligaments, and tendons. This comprehensive evaluation is essential for effective management.[1]

In this case, the osteochondroma presented in a rare and notable form, occurring in the intra-articular epiphysis of the knee joint in an adult. This unusual presentation has been scarcely reported in the literature. The intra-articular location created specific diagnostic challenges. First, the intra-articular position produced nonspecific clinical findings that overlapped with more common causes of knee pain. Second, on radiography, cortical and medullary continuity with the parent bone was not clearly depicted, preventing a confident diagnosis through conventional imaging.

MRI confirmed the lesion's continuity with the bone and accurately depicted the cartilage cap and adjacent soft tissues. It also allowed precise measurement of cartilage cap thickness, a crucial indicator for excluding malignant transformation, and provided detailed assessment of articular cartilage, ligaments, and tendons for possible impingement or injury. This information was instrumental in surgical planning, helping to determine the optimal resection strategy while preserving joint integrity. Without MRI, the diagnosis would likely have remained uncertain, potentially leading to delayed treatment or inappropriate surgical intervention.

The conclusions of this report are limited by the inherent nature of a single-case study. Although the imaging and histopathological findings were definitive, the rarity of this presentation limits generalizability. Additionally, long-term follow-up data, which would provide information regarding postoperative function and recurrence risk, were unavailable for this patient.

CONCLUSION

Intra-articular osteochondroma of the knee is a rare condition. Diagnosing intra-articular osteochondroma using plain radiography alone is challenging. This case underscores the critical role of MRI in facilitating an accurate diagnosis by revealing characteristic features often obscured on radiographs, thereby guiding appropriate clinical management and surgical planning.

ETHICAL COMPLIANCE

This case report was prepared in accordance with the ethical principles outlined in the Declaration of Helsinki. Written informed consent was obtained from the patient for publication of this case report and any accompanying images. All patient identifiers have been removed to maintain confidentiality.

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