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Chondroblastoma of the Knee: a case report

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Introduction and importance: Chondroblastoma is a rare, benign tumour originating from chondroblasts, predominantly affecting the epiphysis of long bones, although it may extend into the metaphysis. This case highlights the diagnostic and therapeutic challenges associated with this condition.

Case presentation: We present the case of a 16-year-old female patient who presented with pain and swelling in the right knee for two months. Imaging revealed an osteolytic lesion in the medial condyle of the femur. An open biopsy and curettage were performed, with histopathological examination confirming the diagnosis of chondroblastoma.

Clinical discussion: Management of chondroblastoma, particularly in weight-bearing areas such as the lower limb, poses significant challenges. In this case, simple curettage yielded a favourable outcome.

Conclusion: The diagnosis of chondroblastoma relies on age, tumour site, and imaging features. Curettage proved effective in managing this case of distal femoral chondroblastoma, demonstrating excellent long-term results.

Key words: BONE AND BONES; NEOPLASMS; CHONDROBLASTOMA; MAGNETIC RESONANCE IMAGING

INTRODUCTION

Chondroblastoma is a rare, benign bone tumour derived from chondroblasts, primarily affecting the epiphysis of long bones, though it may extend into the metaphysis (1). It predominantly occurs in children and young adults aged 10 to 20 years (1). This report presents a case of chondroblastoma of the knee, emphasising the diagnostic and therapeutic challenges.

CASE PRESENTATION

A 16-year-old female presented with a two-month history of pain and swelling in the right knee. The pain was gradual in onset, intermittent,

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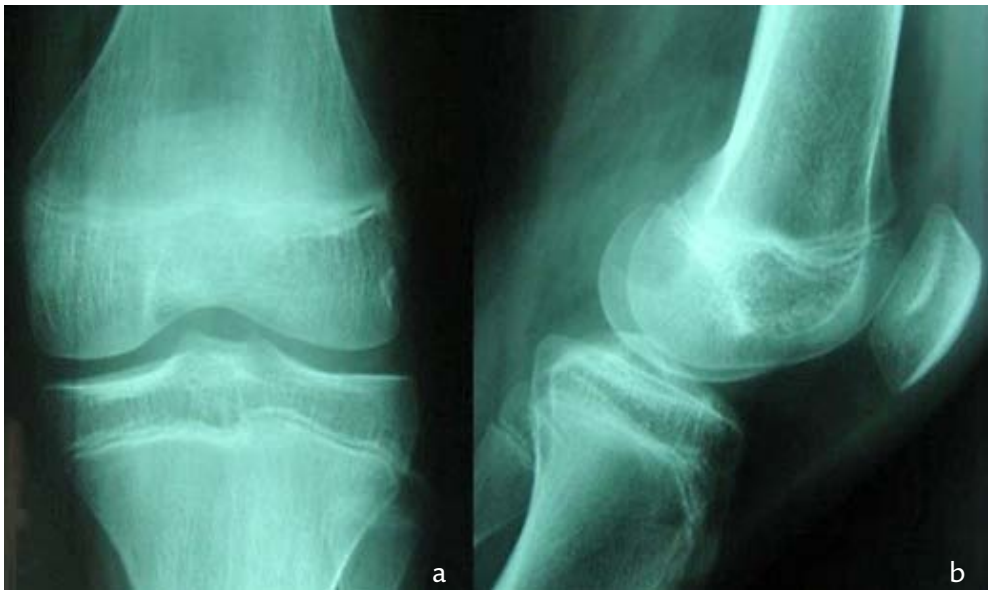

Figure 1. Osteolytic lesion located in the medial condyle of the distal femur.

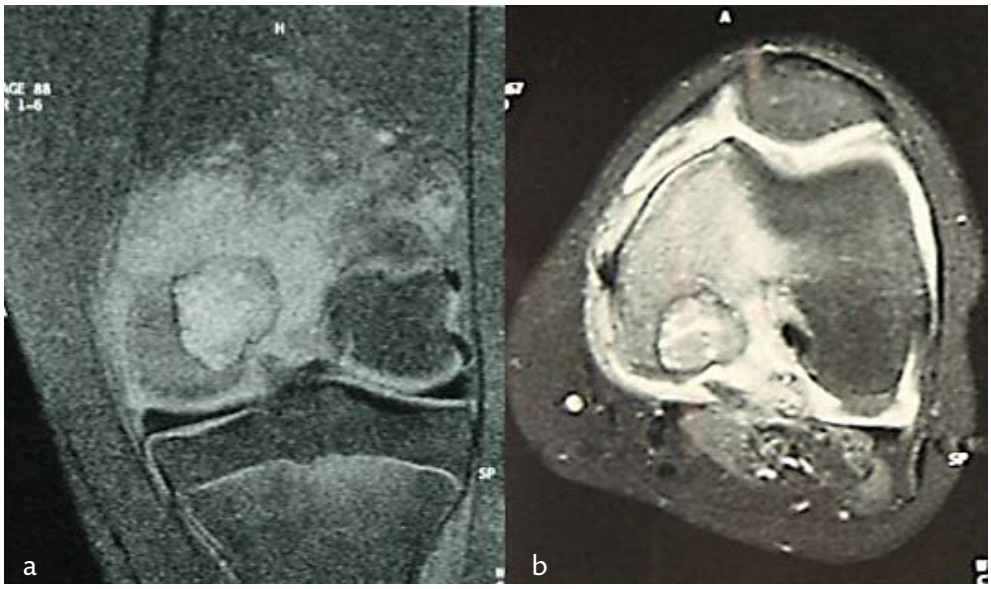

Figure 2. MRI of the knee showing a lesion hypointense on T1-weighted and hyperintense on T2-weighted images.

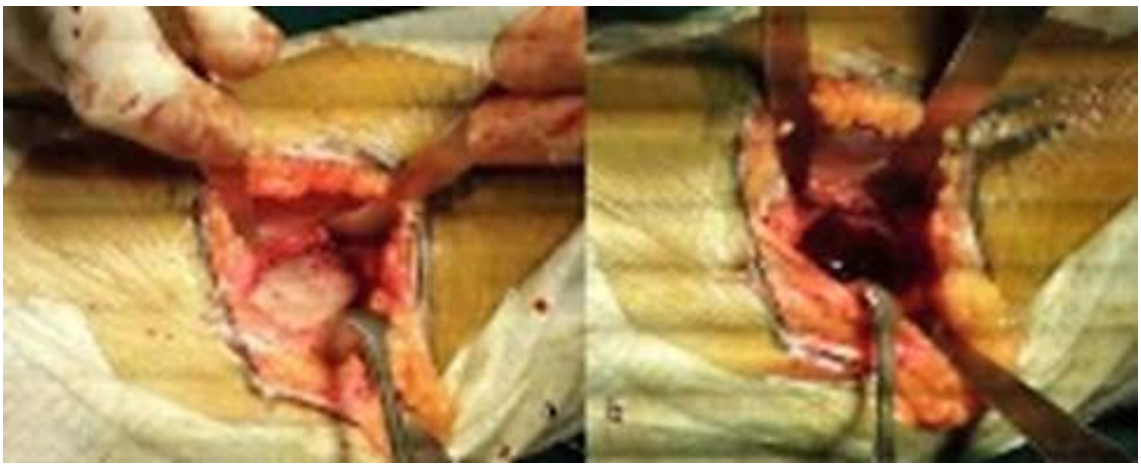

Figure 3. Biopsy and curettage of the lesion via direct approach.

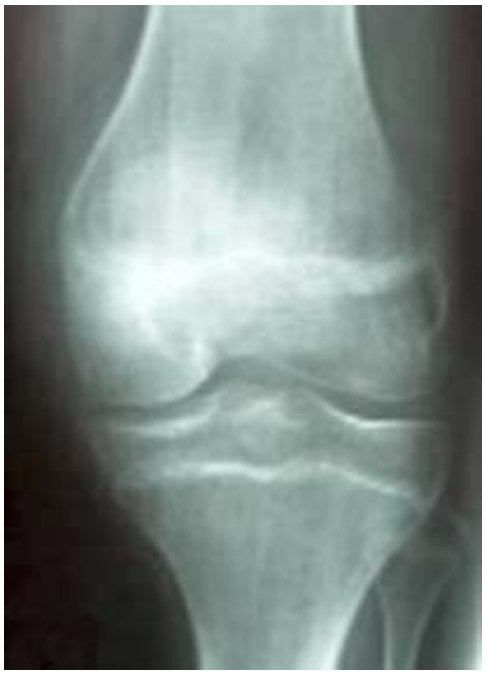

Figure 4. No evidence of recurrence 2 years after the operation.

exacerbated by walking, and alleviated by rest and analgesics. There was no history of trauma, fever, or chills. The clinical examination revealed warmth over the affected area, but no soft tissue involvement or lymphadenopathy was noted.

Radiographs identified an osteolytic lesion in the medial condyle of the distal femur (Figure 1). MRI showed a hypointense lesion on T1-weighted images and hyperintensity on T2-weighted images (Figure 2). Differential diagnoses included osteoblastoma, giant cell tumour, chondroblastoma, and aneurysmal bone cyst. An open biopsy and curettage were performed, with histopathological analysis confirming chondroblastoma (Figure 3). At the two-year follow-up, there was no evidence of recurrence (Figure 4).

DISCUSSION

Chondroblastoma is a rare, benign bone tumour that primarily affects the epiphysis of long bones in adolescents and young adults, with the distal femur being a common site of involvement, as seen in our 16-year-old patient. Although histologically benign, its location in weight-bearing regions such as the knee poses significant diagnostic and therapeutic challenges. Diagnosis relies on clinical presentation, imaging findings, and histopathological confirmation.

Radiographically, chondroblastoma typically presents as a well-defined lytic lesion with sclerotic margins, often accompanied by chondroid matrix calcifications. In our case, MRI played a crucial role, demonstrating the classic hypointense signal on T1-weighted images and hyperintensity on T2-weighted sequences, consistent with previous reports (1, 4). Recent advancements in imaging, including dynamic contrast-enhanced MRI and diffusion-weighted imaging (DWI), have further improved diagnostic accuracy by helping differentiate chondroblastoma from aggressive mimics such as giant cell tumours or clear cell chondrosarcoma (5, 6).

Histopathologically, chondroblastoma is characterised by sheets of chondroblast-like cells with eosinophilic cytoplasm, scattered osteoclast-like giant cells, and distinctive „chicken-wire“ calcifications (7). Immunohistochemical markers such as S100 and SOX9 support the diagnosis, but molecular techniques have recently identified H3F3B (K36M) mutations as a genetic hallmark, offering potential for more precise diagnostic and prognostic stratification (8).

Therapeutically, curettage with or without adjuvant therapy (e.g., phenol, cryotherapy, or bone grafting) remains the gold standard, yielding low recurrence rates in most cases. In our patient, simple curettage without grafting led to an excellent outcome with no recurrence at two years, reinforcing the efficacy of this approach for well-contained lesions. However, larger or more aggressive tumours may require structural reinforcement with bone grafts or cement to prevent pathological fractures, particularly in weight-bearing bones (9, 10). Emerging techniques such as arthroscopy-assisted curettage have shown promise in minimising soft tissue disruption while ensuring complete tumour removal, although long-term data are still being collected (11).

Despite its benign nature, chondroblastoma can occasionally behave aggressively, with recurrence rates of 10–20 %, particularly in cases with incomplete resection or metaphyseal extension. A recent meta-analysis by *Chen et al.* (2023) highlighted that younger age and open physes may correlate with higher recurrence risk, underscoring the need for meticulous surgical technique and close follow-up (11). While our patient had no

evidence of recurrence, future studies should explore the role of 3D-printed patient-specific implants for large post-curettage defects and liquid biopsy for detecting minimal residual disease via H3F3B mutations. Additionally, targeted therapies such as denosumab (a RANKL inhibitor) are being investigated for recurrent or unresectable cases, though their use remains experimental.

In conclusion, chondroblastoma of the knee requires a multidisciplinary approach combining advanced imaging, careful histopathological evaluation, and precise surgical management. Our case demonstrates that curettage remains an effective treatment for epiphyseal lesions, with excellent functional outcomes when performed meticulously. Future research should focus on molecular profiling and minimally invasive techniques to further optimise patient care.

CONCLUSION

The major diagnostic criteria of chondroblastoma are age, tumour site, and imaging features. Patients in the appropriate age group with typical radiological features – such as the presence of a chondroid matrix, perilesional marrow and soft tissue oedema, marginal sclerosis, and periosteal reaction – may be diagnosed with chondroblastoma. Imaging with MRI and radiography should always be supplemented with a biopsy for definitive diagnosis. Managing chondroblastoma of the distal femur with curettage has shown good outcomes, as illustrated by this case.

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SAŽETAK

Hondroblastom koljena: prikaz slučaja

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Uvod: Hondroblastom je rijedak, benigni tumor koji potječe od hondroblasta, pretežno zahvaćajući epifizu dugih kostiju, iako se može proširiti i u metafizu. Ovaj slučaj ističe dijagnostičke i terapijske izazove povezane s ovim stanjem.

Prikaz slučaja: Predstavljamo slučaj 16-godišnje pacijentice koja se javila s bolovima i oticanjem u desnom koljenu dva mjeseca. Slikovnim snimanjem otkrivena je osteolitička lezija u medijalnom kondilu femura. Izvršena je otvorena biopsija i kiretaža, a histopatološki pregled potvrdio je dijagnozu hondroblastoma.

Rasprava: Liječenje hondroblastoma, posebno u područjima koja nose težinu, poput donjih ekstremiteta, predstavlja značajne izazove. U ovom slučaju, jednostavna kiretaža dala je povoljan ishod.

Zaključak: Dijagnoza hondroblastoma ovisi o dobi, mjestu tumora i slikovnim značajkama. Kiretaža se pokazala učinkovitom u liječenju ovog slučaja distalnog femoralnog hondroblastoma, pokazujući izvrsne dugoročne rezultate.

Ključne riječi: KOST I KOSTI; NEOPLAZME; HONDROBLASTOM; MAGNETSKA REZONANCIJA