


Osteochondroma of the Proximal Tibia in a 12-Year-Old Male: A Case Report

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ABSTRACT

Introduction: Osteochondroma is the most common benign bone tumor, commonly occurring in the metaphyseal region of long bones during the second and third decades of life. Although frequently asymptomatic, osteochondroma arising from the proximal tibia in a skeletally immature patient is uncommon and may present challenges due to its proximity to the growth plate. This case highlights the diagnostic and surgical considerations in pediatric patient required to preserve skeletal growth while achieving complete tumor removal. **Case:** A 12-year-old boy presented with a painless swelling over the proximal region of the right tibia that had progressively developed over two months. Physical examination revealed a firm, immobile bony mass measuring approximately 2 × 2.5 cm, no tenderness and without neurovascular impairment. Radiographic evaluation demonstrated a pedunculated osteochondroma with continuity of the cortex and medulla with the host bone, showing growth away from the epiphysis and a positive neck sign. Surgical excision was performed with careful preservation of surrounding neurovascular structures. Histopathological examination confirmed the diagnosis of conventional osteochondroma without malignant features. **Conclusion:** This case represents an uncommon presentation of proximal tibial osteochondroma in a skeletally immature patient. Early recognition, appropriate imaging assessment, and meticulous surgical planning are essential to prevent complications and maintain normal limb function. At follow-up, the patient showed no recurrence and returned to normal activities.

Keywords: Case report, osteochondroma, pediatric bone tumor, proximal tibia, skeletal immaturity.

ABSTRAK

Pendahuluan: Osteokondroma merupakan tumor tulang jinak yang paling sering ditemukan dan umumnya berasal dari daerah metafisis tulang panjang pada usia muda. Meskipun sebagian besar bersifat asimtomatik, osteokondroma yang berasal dari tibia proksimal pada pasien dengan tulang yang masih mengalami pertumbuhan merupakan kondisi yang jarang ditemukan dan memiliki tantangan tersendiri karena kedekatannya dengan lempeng pertumbuhan. Laporan kasus ini menggambarkan aspek diagnostik dan pertimbangan tindakan pembedahan pada pasien pediatrik untuk mencapai pengangkatan tumor secara menyeluruh dengan tetap mempertahankan potensi pertumbuhan tulang. **Kasus:** Anak laki-laki berusia 12 tahun datang dengan keluhan pembengkakan tanpa nyeri pada tibia proksimal kanan yang berkembang secara progresif selama dua bulan. Pemeriksaan fisik menunjukkan massa tulang berukuran sekitar 2 × 2,5 cm, tidak nyeri tekan, dan tidak ditemukan gangguan neurovaskular. Pemeriksaan radiografi menunjukkan adanya osteokondroma bertangkai (*pedunculated osteochondroma*) dengan kontinuitas korteks dan medula terhadap tulang induk, pertumbuhan menjauhi epifisis, serta tanda leher positif (*positive neck sign*). Eksisi bedah dilakukan dengan mempertahankan struktur neurovaskular di sekitarnya. Pemeriksaan histopatologi mengonfirmasi diagnosis osteokondroma konvensional tanpa tanda keganasan. **Simpulan:** Kasus ini menunjukkan presentasi osteokondroma tibia proksimal yang jarang pada pasien dengan tulang yang belum matur. Diagnosis dini, evaluasi radiologi yang tepat, dan perencanaan operasi yang cermat diperlukan untuk mencegah komplikasi serta mempertahankan fungsi ekstremitas. Pasien menunjukkan hasil klinis yang baik tanpa tanda rekurensi pada evaluasi lanjutan. **Fachrizal Arfani Prawiragara, Leonardo Tedjaprasadja. Osteokondroma Tibia Proksimal pada Laki-laki Usia 12 Tahun - Laporan Kasus.**

Kata Kunci: Laporan kasus, osteokondroma, tumor tulang pediatrik, tibia proksimal, tulang belum matur.

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INTRODUCTION

Osteochondromas, also known as osteocartilaginous exostoses, are the most prevalent type of bone tumor, representing 20% to 50% of all benign bone tumors and 10% to 15% of all bone tumors.[1–3] These tumors typically arise in long bones, particularly around the metaphyses of the distal femur, proximal tibia, or humerus.

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Osteochondromas are characterized by bony projections covered by a cartilage cap on the bone's outer surface, predominantly located in the appendicular skeleton. They primarily affect growing bones and are frequently seen in younger individuals, with a typical onset occurring during the second or third decade of life.

Accurately determining the true incidence of various bone tumors remains challenging, and epidemiological data in the literature can often be unclear or underestimated.[1,4] This difficulty occurs because many lesions are detected incidentally through imaging examinations, and histological confirmation is not always performed.[4] This condition is particularly relevant for benign lesions such as small asymptomatic enchondromas, osteochondromas, or intraosseous lipomas. In contrast, malignant bone lesions generally exhibit more aggressive behavior and are more likely to produce clinical symptoms that require further evaluation. Consequently, available epidemiological data regarding malignant bone tumors are often more comprehensive than those regarding benign bone tumors because malignant lesions are more frequently biopsied and investigated.[4]

Determining the incidence of primary benign bone tumors remains difficult because not all newly identified lesions undergo biopsy or surgical evaluation. In many cases, biopsy or resection may not be required when clinical and radiographic findings are sufficient to establish a benign diagnosis.[4] Osteochondroma is among the most common benign bone neoplasms, followed by enchondroma, giant cell tumor of bone, osteoid osteoma, and fibrous dysplasia.[4] Although osteochondromas are generally considered benign lesions, certain anatomical locations may require additional evaluation and treatment due to the potential risk of complications, including pathological fractures, deformities, or compression of surrounding neurovascular structures.[4]

Osteochondromas are commonly diagnosed based on characteristic clinical and radiographic findings. They usually present as painless, slow-growing masses and are frequently discovered incidentally. However, symptomatic lesions may cause pain, restricted movement, deformity, fracture, bursal formation, or compression of adjacent nerves and blood vessels. The majority of osteochondromas occur in the metaphyseal region of long bones, particularly around the knee and shoulder. Although proximal tibial involvement is recognized, osteochondroma arising from the proximal tibia in a skeletally immature patient remains uncommon and warrants careful consideration given its proximity to the growth plate.

In pediatric patients, osteochondroma management requires careful assessment because surgical intervention near the physis may potentially interfere with normal skeletal growth. Complete excision should be balanced with preservation of the growth plate and surrounding neurovascular structures. Therefore, accurate diagnosis, appropriate imaging evaluation, and individualized surgical planning are essential to achieve optimal outcomes.

Although osteochondroma is the most common benign bone tumor, its occurrence in the proximal tibia of skeletally immature patients is uncommon. This case was selected for the rare presentation of a solitary pedunculated osteochondroma arising from the proximal tibia in a 12-year-old male, with the lesion located near the epiphyseal growth plate. The case highlights the diagnostic and surgical challenges associated with managing osteochondroma in a growing skeleton, particularly the importance of early recognition, radiological assessment, and careful surgical techniques to achieve complete tumor removal while preserving normal skeletal growth potential. This report aims to describe the clinical presentation, diagnostic evaluation, surgical management, and short-term outcome of proximal tibial osteochondroma in a skeletally immature patient.

Written informed consent for publication was obtained from the patient's parents/legal guardians prior to the inclusion of clinical information, radiographic images, intraoperative photographs, and histopathological findings in this case report. All identifiable patient information was removed to ensure confidentiality and privacy.

CASE

A 12-year-old boy presented to the Orthopedic Outpatient Clinic with progressive swelling of the right calf, developing over the past two months. The swelling was painless, without a history of weight loss, trauma, fever, or family history of similar conditions. On physical examination, a mass was observed on the medial side of the proximal cruris dextra. The mass was non-tender, immobile, measured approximately 2 × 2.5 cm, showed no warmth, and its color was consistent with the surrounding skin **(Figure 1)**. The dorsalis pedis, anterior tibial, and posterior tibial arteries were palpable with strong pulses. Distal extremity oxygen saturation was 99%. The range of motion was preserved, and no hypoesthesia was noted.

Radiographic examination revealed a bone exostosis arising from the proximal right tibia, characterized by continuity between the lesion's cortex and medulla with the host bone. The lesion demonstrated growth away from the epiphysis and showed a positive neck sign (arrow), consistent with a pedunculated osteochondroma **(Figure 2)**. Although the patient had no pain or neurovascular impairment, surgical excision was performed considering several factors. The lesion was located in the proximal tibia near the growth region of a skeletally immature patient, raising concerns about potential future growth-related complications.

Furthermore, complete excision allowed definitive histopathological confirmation of the diagnosis and exclusion of malignant transformation. The decision for surgical management was based on an individualized assessment of the patient's age, lesion location, radiological characteristics, and potential risk associated with continued skeletal growth. Surgical excision was performed under general anesthesia. The osteochondroma was completely removed with meticulous preservation of the surrounding neurovascular structures to prevent complications. A representative tissue sample was sent for histopathological examination. The procedure was successfully completed without intraoperative complications **(Figure 3)**. Histopathological examination revealed neoplastic tissue composed of mature chondrocytes and osteocytes with no evidence of malignant cells. These findings confirmed the diagnosis of conventional osteochondroma, a benign


tumor of bone and cartilage **(Figure 4).**

The patient was followed up at 6 weeks postoperatively. Follow-up radiographs showed no evidence of recurrence or residual bone exostosis. The cortex and medulla were seamlessly integrated with the host bone, and the bone structure appeared within normal limits **(Figure 5)**. The patient reported complete resolution of symptoms and a successful return to daily activities without restrictions.

DISCUSSION

Osteochondroma, also known as osteocartilaginous exostosis or cartilage-capped exostosis, is a broad (sessile) or narrow (pedunculated) skeletal protrusion composed of cortical and medullary bone covered by a cartilage cap. Osteochondroma is the most frequently occurring benign skeletal tumor, with an estimated incidence of 1% to 2% in the general population and accounting for approximately 10% to 15% of all bone tumors.[5] Both solitary and multiple osteochondromas are more frequently observed in males, with reported male predominance.[5,6] These lesions commonly arise from the metaphyseal regions of long bones, particularly around the distal femur, proximal tibia, and proximal humerus. Although uncommon locations such as the spine have also been reported.[5,6,10,15]

Osteochondroma is frequently asymptomatic and is often discovered incidentally through radiographic evaluation. Clinical manifestations may include pain, progressive swelling, restricted joint movement, deformity, pathological fracture, bursa formation, and compression of adjacent tendons, nerves, or blood vessels.[9,10] Although most osteochondromas have a benign course, careful evaluation is required if lesions demonstrate atypical features, rapid enlargement, symptoms after skeletal maturity, or anatomical locations associated with potential complications.

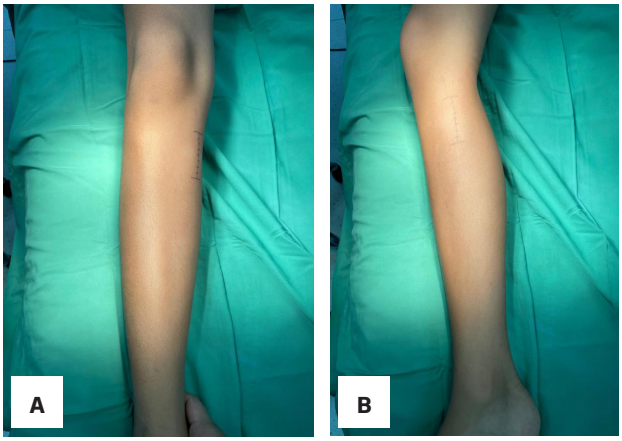

*Photo documentation by Fachrizal Arfani Prawiragara, Leonardo Tedjaprasadja.

Figure 1. Clinical photo of proximal right tibia. A. Anterior view; B. Medial view. The osteochondroma is relatively small, measuring approximately 2 x 2.5 cm, which may not be easily discernible in the anterior and medial view photographs provided.

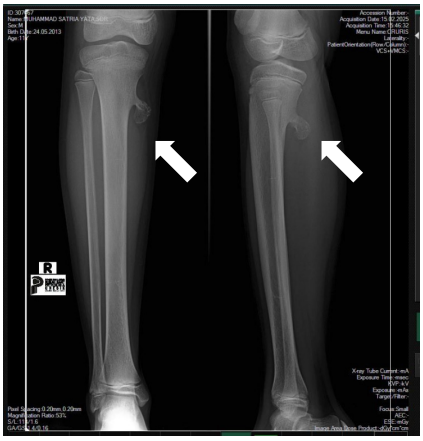

*Photo documentation by Fachrizal Arfani Prawiragara, Leonardo Tedjaprasadja.

Figure 2. Radiograph of the proximal right tibia lateral view shows a bone exostosis characterized by the cortex and medulla, continuous with the host bone, exhibiting growth away from the epiphysis and a positive neck sign (arrow).

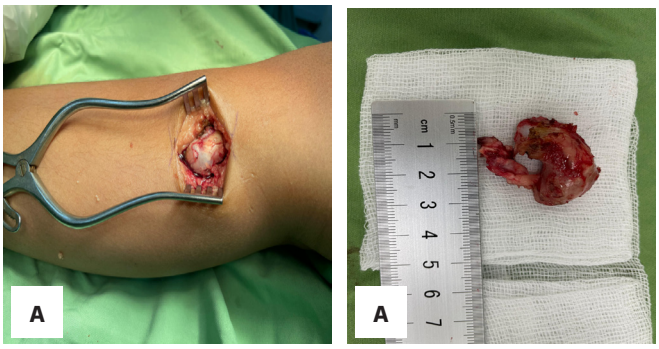

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Figure 3. Intraoperative photograph demonstrating excision of pedunculated osteochondroma from the proximal tibia in a skeletally immature patient. A. Bone tumor (arrow); B. Post-excision bony bed.

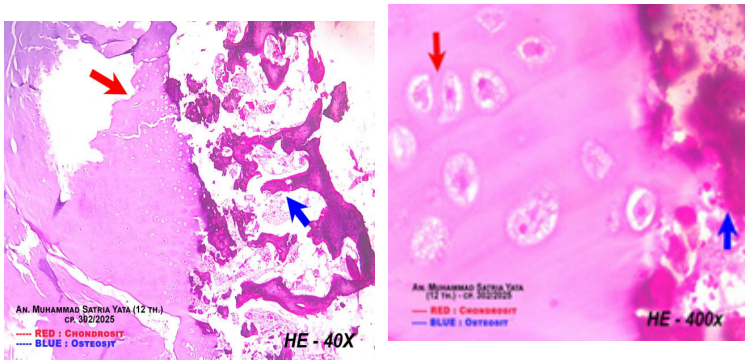

*Photo documentation by Fachrizal Arfani Prawiragara, Leonardo Tedjaprasadja.

Figure 4. The histopathological results indicate the presence of neoplastic tissue growth composed of mature chondrocytes and osteocytes, accompanied by minimal hemorrhage. Malignant cells were not identified. These findings are consistent with a diagnosis of conventional osteochondroma. (**The red arrows show** the chondrocytes, and the blue arrows **show** the osteocytes.).

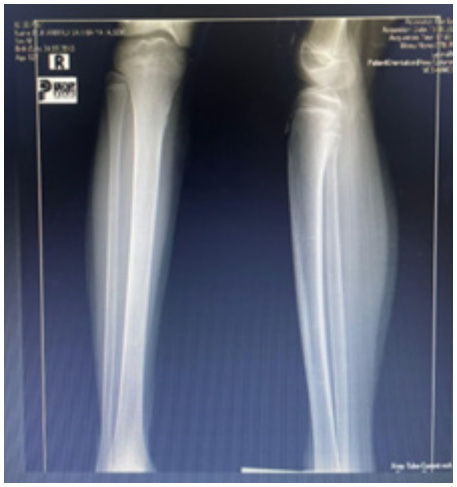

*Photo documentation by Fachrizal Arfani Prawiragara, Leonardo Tedjaprasadja.

Figure 5. Post-operative radiograph reveals no bone exostosis, the cortex and medulla seamlessly integrated with the host bone and demonstrating growth in the epiphysis of the proximal right tibia. The bone structure appears within normal limits.

The primary management strategy for asymptomatic osteochondroma is usually observation with periodic clinical and radiological follow-up. Surgical excision is generally indicated in patients with persistent pain, functional impairment, neurovascular compression, deformity, pathological fracture, uncertainty of diagnosis, or suspicion of malignant transformation.[7,11] In pediatric patients, additional considerations are required because lesions located near the physis may potentially interfere with normal skeletal growth, and surgical intervention carries a risk of physeal injury. Therefore, the decision to perform surgery should be individualized based on patient age, skeletal maturity, lesion location, radiological characteristics, and the potential risk of future complications.

In the present case, the patient was a 12-year-old male with an osteochondroma arising from the proximal tibia near the growth region. Although the lesion was asymptomatic, surgical excision was considered due to its anatomical location in a skeletally immature patient and the potential risk of future growth-related complications. Furthermore, excision provided definitive histopathological confirmation and ensured complete removal of the lesion while preserving the surrounding neurovascular structures. The favorable postoperative outcome emphasizes the importance of individualized assessment and careful surgical planning in pediatric osteochondroma cases.

Radiographic evaluation remains essential for diagnosing osteochondroma and assessing lesion characteristics, including size, location, cortical and medullary continuity, growth direction, and relationship with adjacent anatomical structures. Computed tomography (CT) and magnetic resonance imaging (MRI) may provide additional information in selected cases. CT is particularly useful for evaluating complex bony anatomy, while MRI is valuable for assessing cartilage cap thickness, soft tissue extension, vascular involvement, and possible malignant transformation.[7,11]

In this case, MRI was not performed because the patient showed typical clinical and radiographic characteristics of a benign pedunculated osteochondroma, including continuity of the cortex and medulla with the host bone, growth away from the epiphysis, and a positive neck sign. In addition, there were no concerning clinical features such as persistent pain, rapid enlargement, neurological deficits, or radiographic evidence of aggressive behavior or soft tissue involvement that would require further MRI evaluation. The diagnosis was subsequently confirmed through histopathological examination, which demonstrated mature chondrocytes and osteocytes without malignant characteristics. Therefore, additional MRI imaging was considered unnecessary in this case.

Several differential diagnoses were considered, including parosteal osteosarcoma, periosteal chondroma, and chondrosarcoma. Parosteal osteosarcoma may present as a surface-based bone lesion but typically demonstrates aggressive radiographic features, including irregular mineralization, cortical destruction, and loss of corticomedullary continuity with the underlying bone. Periosteal chondroma may occur on the bone surface but generally appears as a saucer-shaped cortical erosion rather than a pedunculated lesion with corticomedullary continuity. Secondary chondrosarcoma arising from osteochondroma was considered less likely because the patient was young, the lesion lacked suspicious clinical features such as rapid growth or pain after skeletal maturity, and histopathological examination showed no malignant cartilage or atypical cells. In this case, the combination of clinical findings, characteristic radiographic features, and histopathological confirmation supported the diagnosis of conventional osteochondroma.

Incomplete removal of the cartilage cap or residual tumor tissue may increase the risk of recurrence, particularly in pediatric patients, given their ongoing skeletal growth.[12,13] Therefore, complete excision while preserving the growth plate and surrounding structures is essential to minimize recurrence and prevent complications. In this case, complete tumor removal was achieved without postoperative complications, and follow-up evaluation at 6 weeks showed no evidence of recurrence.

Since the patient remains skeletally immature, long-term surveillance is required to monitor for local recurrence, growth disturbance, limb deformity, or other complications. The patient should undergo periodic clinical and radiographic evaluations every 6 months until skeletal maturity to assess bone growth, alignment, and potential recurrence. Long-term follow-up is particularly important in pediatric osteochondroma cases because a residual cartilage cap or incomplete excision may increase the risk of recurrence during continued growth.

CONCLUSION

This pediatric case underscores the importance of early recognition and management of proximal tibia osteochondroma in skeletally immature patients, even in asymptomatic cases. The proximity to growth plates and the extensor mechanism presents unique diagnostic and surgical challenges. While comprehensive imaging is essential, this case utilized x-ray for diagnosis, highlighting its role in identifying bony lesions. Complete surgical excision may be considered in selected children with asymptomatic lesions, taking into account the anatomical location of the lesion in a skeletal immaturity patients and the potential risk of future growth disturbances, to optimized functional outcomes. With proper intervention, children can maintain normal activities.


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