Epiphyseal Chondromyxoid Fibroma With Prominent Adipose Tissue: An Unusual Radiologic and Histologic Presentation

Christopher Kragel, MD, Gene P. Siegal, MD, PhD, and Shi Wei, MD, PhD

Abstract

Chondromyxoid fibroma (CMF) is a rare benign tumor that typically develops in the metaphyseal intramedullary portion of long bones. The tumor may extend into the diaphysis or, seldom, into the epiphysis, but purely epiphyseal lesions are extremely rare, with only 2 cases having been reported in the literature.

In this article, we report the case of a 51-year-old African American woman. Radiographs showed a well-defined, subarticular lytic lesion in the epiphysis of the right proximal tibia extending to the adjacent metaphysis. Histologic sections of the curetted specimen showed lobules of spindled and stellate cells in a zonal distribution on a background of abundant chondromyxoid stroma, features characteristic of CMF. In addition, mature adipose tissue streamed throughout the lesion—a unique finding that until now had not been recorded in CMF at any location. Thus, *chondromyxoid fibrolipoma* may be an appropriate term for this lesion.

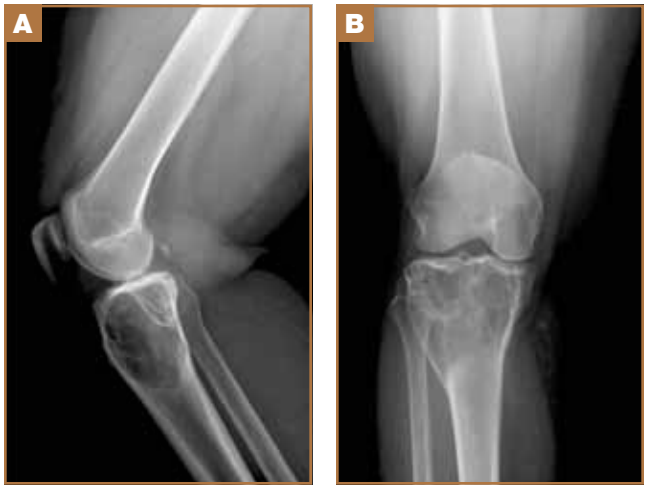

Figure 1. Conventional radiographs (A, lateral view; B, anteroposterior view) show a large, expansile subarticular lytic lesion with internal bony septations in the epiphysis of the right proximal tibia extending into the adjacent metaphysis. Lesion has well-defined borders. The surrounding cortex is intact; there is no periosteal reaction.

Chondromyxoid fibroma (CMF) is a rare benign bone tumor that was first described in 1948 by Jaffe and Lichtenstein,[1] who emphasized the pitfall of mistaking this entity for more menacing lesions, such as chondrosarcomas. Multiple series have shown the typical presentation in the second or third decade of life, though pediatric and geriatric cases have been noted.[2-4] CMF is generally thought to be sex-neutral, though some series showed a slight male predilection.[2,5] The chief concern typically is longstanding pain. Histologically, the tumor classically consists of lobules of spindled and stellate cells on a background of abundant chondromyxoid stroma with peripheral cellular condensation. The tumors usually arise within the metaphyseal intramedullary portion of long bones, pelvic bones, and small bones of hands and feet. Juxtacortical CMF, a variant often associated with older age at onset, is more likely to show calcifications that may be extensive.[6] CMFs can extend into the diaphysis or, seldom, into the epiphysis, but purely epiphyseal lesions are exceedingly rare, with only 2 cases having been reported in the literature.[7-9]

The physiologic development of the epiphyses of bone differs from that of other parts of the skeleton. The incidence of primary tumors in this location is low, with chondroblastoma and giant cell tumor being the most common entities in children and adults, respectively.

In this article, we report the case of CMF in the epiphysis of the right proximal tibia of a 51-year-old woman. The tumor in this unusual anatomical location was composed of prominent mature (adult) adipose tissue that maintained the usual lobular architecture.

The patient provided written informed consent for print and electronic publication of this case report.

Authors' Disclosure Statement: The authors report no actual or potential conflict of interest in relation to this article.

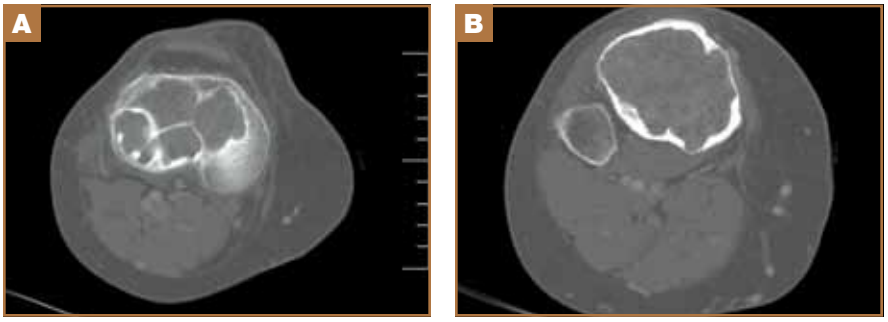

Figure 2. Axial computed tomography of the right knee (A and B, proximal and distal aspects of the lesion, respectively) shows an expansile lytic lesion of the proximal tibia with thin septations and areas of endosteal scalloping. The lesion is approximately 6×5 cm near the articular surface. There is no cortical destruction, soft-tissue extension, or periosteal reaction.

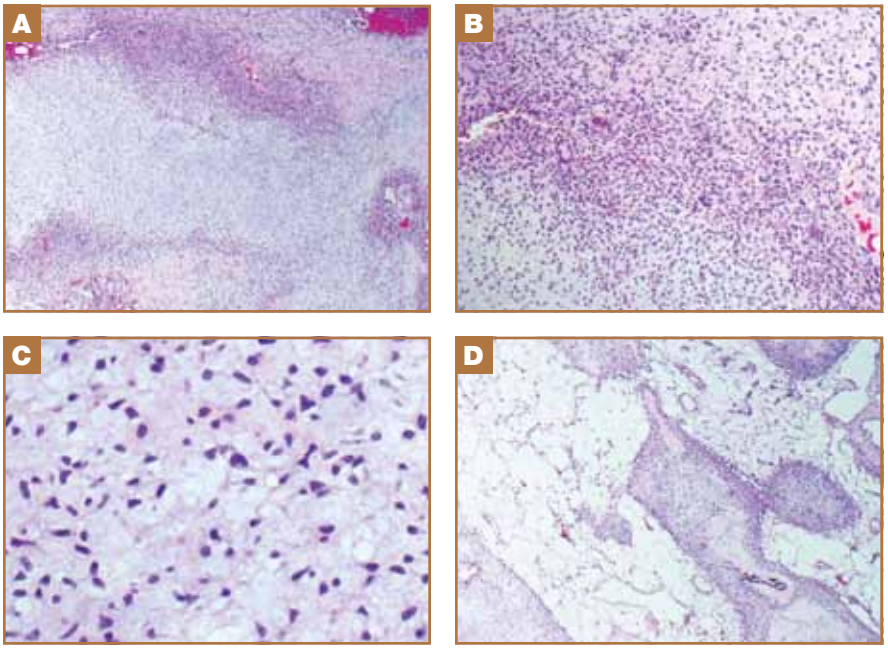

Figure 3. Histologic characteristics of the tumor (hematoxylin-eosin stains). (A) The lesion consists of stellate and spindle-shaped cells arranged in a lobular growth pattern on a background of chondromyxoid matrix with peripheral cellular condensation (original magnification ×4). (B) Osteoclast-like multinucleated giant cells are often found at vascular-rich fibrous septa (original magnification ×10). (C) Lesional cells exhibit indistinct to pale eosinophilic cytoplasm with bipolar or tripolar cytoplasmic extensions and show minimal cytologic atypia (original magnification ×20). (D) Sheets of mature adipose tissue stream throughout the lesion between lobules. Focal coarse calcifications are also present with no specific distribution with respect to the lobular nature of the lesion (original magnification ×4).

Case Report

A 51-year-old African American woman presented with worsening right knee pain that had been present for more than 1 year. She described having an active lifestyle in the past but now being able to walk only with assistance. She had a limp at time of presentation. The pain was alleviated by sitting and exacerbated by weight-bearing. She described the pain as sharp and continuous and rated it 8 or 9 on a 10-point scale. Physical examination revealed normal strength with dorsiflexion and plantar flexion of the right foot, slightly decreased strength of hip abduction and adduction, and only antigravity motion on knee extension. In addition, there was decreased range of motion in the right knee joint.

Conventional radiographs showed a subarticular lytic lesion with well-defined borders. It extended from within the epiphysis of the right proximal tibia to the adjacent metaphysis (**Figure 1**). Computed tomography of the knee showed an expansile lytic lesion of the proximal tibia with thin septations and areas of endosteal scalloping. There was no periosteal reaction (**Figure 2**), and there were no other features of aggressiveness, such as cortical breakthrough or soft-tissue extension. Given the patient's age and clinical and radiographic presentation, we thought the lesion was benign, and chiefly focused the diagnostic consideration on giant cell tumor of bone. The patient underwent open biopsy and curettage with subsequent cementation.

On gross examination, the curetted specimen was remarkable for being solid, yellow-tan, glistening soft-tissue with a vaguely lobulated appearance. No myxoid, cystic, or hemorrhagic changes were identified. Microscopically, the lesion consisted of stellate and spindle-shaped cells in a lobular growth pattern on a background of chondromyxoid matrix. The lobules had hypocellular centers and were separated by vascular-rich fibrous septa with peripheral cellular condensation (**Figure 3A**). Many variably sized, osteoclast-like multinucleated giant cells were found at the lobular peripheries (**Figure 3B**). The lesional cells exhibited an indistinct to pale eosinophilic cytoplasm with bipolar or tripolar cytoplasmic extensions (**Figure 3C**). There was minimal cytologic atypia. Mitotic activity was not discernible. In summary, the overall histologic features were characteristic of CMF. Sheets of mature adipocytes streamed throughout the lesion between the lobules (**Figure 3D**). In addition, focal coarse calcifications were identified; these showed no specific distribution with respect to the lobular nature of the lesion (**Figure 3D**).

The postoperative course was uneventful, and the patient was well and ambulatory 1 year after surgery.

Discussion

CMFs are extremely rare chondroid neoplasms, accounting for less than 1% of all primary bone tumors.[10] Significant morbid-

ity occurs in terms of local symptomatology—30% to 40% of these tumors occur around the knee, causing difficulty with ambulation—yet there is no significant mortality.[4,7,11] Hypotheses that CMFs may undergo malignant transformation have long been discredited as being based on diagnostic error; such transformation is not a true pathophysiologic process.[12] In fact, in 1948 Jaffe and Lichtenstein[1] flagged the diagnostic pitfall of confusing CMF with chondrosarcoma, and vice versa.

The epiphysis extends from the base of the articular surface to the growth/epiphyseal plate. The latter is the site of enchondral ossification, a remarkable process involving an ordered proliferation of chondrocytes and subsequent ossification. The biological demands of the epiphysis necessitate a specific cellular milieu that is thought to give rise to only a limited number of neoplastic processes, the most common being chondroblastoma in skeletally immature individuals and giant cell tumor of bone in adults. Primary epiphyseal neoplasms other than these 2 entities are exceedingly rare; the literature includes only exceptional reports of clear cell chondrosarcoma, enchondroma, osteoid osteoma, and Langerhans cell histiocytosis. Yet, in this case report we have described a CMF arising from the epiphysis. The relationship between CMF and chondroblastoma has been thoroughly discussed in the literature. The 2 lesions are thought to arise from the metaphyseal and epiphyseal portions of the growth plate, respectively. A cartilaginous origin has been demonstrated in ultrastructural studies and reinforced in studies showing the expression of S-100 protein.[13-15] In addition, studies have shown that, in a small proportion of cases, CMFs contain foci cytologically compatible with chondroblastomas.[2,16]

> "In the present case, curettage and subsequent cementation markedly improved ambulation, and there were no signs of recurrence the first year after surgery."

Calcifications, which have been found in 6.8% to 35.3% of CMF cases in various series, are typically associated with older age of onset and unusual locations, such as the skull, the facial bones, and the ribs.[2,3] Juxtacortical CMFs, tumors arising from the periosteum or the cortex, are linked to extensive calcifications as well.[6] Radiologically differentiating these lesions from periosteal enchondromas can be particularly difficult.[17] Microcalcifications are less frequently detected radiographically but more commonly found histologically,[3] as in the present case.

Adipose tissue is an unusual component of any primary bone tumor. Lipoma of bone accounts for less than 0.1% of all primary bone tumors and is almost always in the intramedullary location; only 2 cases of intracortical lipoma have been reported.[18-20] These lesions share some of the radiographic characteristics of CMFs. They show a well-defined lytic mass surrounded by a thin rim of sclerosis, with occasional calcifications. Although it can be proposed that the present case represents a composite lesion, lipoma and CMF, both lesions occur extremely rarely in this location. Per Occam's razor, a single tumor with heterogeneous elements is the more likely explanation. Another fat-containing tumor in bone is liposclerosing myxofibrous tumor (LSMFT), a benign fibro-osseous lesion with diverse histologic elements, including lipoma, xanthoma, myxoma, fibrous dysplasia-like features, cyst formation, and ischemic ossification. LSMFT has a striking predilection for the femur, particularly the intertrochanteric region.[21] Although hypertrophic fat is a constantly present lesional component, LSMFT typically is not in the histologic differential diagnosis of CMF.

The goals of CMF management are to control the local destruction caused by the lesion and to maintain or improve function. Similar to other benign bone tumors, including giant cell tumor of bone, CMF is often managed with surgical curettage followed by cementation. Whenever there is a particular concern for recurrence or fracture after curettage, an en bloc wide excision can be performed.[22] In the present case, curettage and subsequent cementation markedly improved ambulation, and there were no signs of recurrence the first year after surgery.

We have presented a case of CMF that is unusual in that it developed in an extremely uncommon location and had a fat component. To our knowledge, up until now a fat component was not reported for any CMF in any location. Thus, we propose the term *chondromyxoid fibrolipoma* for this unique lesion.

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References

1. Jaffe HL, Lichtenstein L. Chondromyxoid fibroma of bone; a distinctive benign tumor likely to be mistaken especially for chondrosarcoma. *Arch Pathol*. 1948;45(4):541-551.
2. Wu CT, Inwards CY, O'Laughlin S, Rock MG, Beabout JW, Unni KK. Chondromyxoid fibroma of bone: a clinicopathologic review of 278 cases. *Hum Pathol*. 1998;29(5):438-446.
3. Yamaguchi T, Dorfman HD. Radiographic and histologic patterns of calcification in chondromyxoid fibroma. *Skeletal Radiol*. 1998;27(10):559-564.
4. Schajowicz F, Gallardo H. Chondromyxoid fibroma (fibromyxoid chondroma) of bone. A clinico-pathological study of thirty-two cases. *J Bone Joint Surg Br*. 1971;53(2):198-216.

5. Gherlinzoni F, Rock M, Picci P. Chondromyxoid fibroma. The experience at the Istituto Ortopedico Rizzoli. *J Bone Joint Surg Am*. 1983;65(2):198-204.
6. Baker AC, Rezeanu L, O'Laughlin S, Unni K, Klein MJ, Siegal GP. Juxtacortical chondromyxoid fibroma of bone: a unique variant: a case study of 20 patients. *Am J Surg Pathol*. 2007;31(11):1662-1668.
7. Zillmer DA, Dorfman HD. Chondromyxoid fibroma of bone: thirty-six cases with clinicopathologic correlation. *Hum Pathol*. 1989;20(10): 952-964.
8. Gardner DJ, Azouz EM. Solitary lucent epiphyseal lesions in children. *Skeletal Radiol*. 1988;17(7):497-504.
9. Fotiadis E, Akritopoulos P, Samoladas E, Akritopoulou K, Kenanidis E. Chondromyxoid fibroma: a rare tumor with an unusual location. *Arch Orthop Trauma Surg*. 2008;128(4):371-375.
10. Unni KK. *Dahlin's Bone Tumors General Aspects and Data on 11,087 Cases*. Philadelphia, PA: Lippincott-Raven; 1996.
11. Wilson AJ, Kyriakos M, Ackerman LV. Chondromyxoid fibroma: radiographic appearance in 38 cases and in a review of the literature. *Radiology*. 1991;179(2):513-518.
12. Bernd L, Ewerbeck V, Mau H, Cotta H. Characteristics of chondromyxoid fibroma: are malignant courses possible? Presentation of personal cases and review of the literature [in German]. *Unfallchirurg*. 1994;97(6):332-335.
13. Siegal GP, Kennedy JW, Adams CLV, McGuirt Jr WF. Immunohistochemical support for the cartilagenous histogenesis of chondromyxoid fibroma of bone. *Lab Invest*. 1993;6811A.
14. Ushigome S, Takakuwa T, Shinagawa T, Takagi M, Kishimoto H, Mori N. Ultrastructure of cartilaginous tumors and S-100 protein in the tumors. With reference to the histogenesis of chondroblastoma, chondromyxoid fibroma and mesenchymal chondrosarcoma. *Acta Pathol Jpn*. 1984;34(6):1285-1300.
15. Monda L, Wick MR. S-100 protein immunostaining in the differential diagnosis of chondroblastoma. *Hum Pathol*. 1985;16(3):287-293.
16. Dahlin DC. Chondromyxoid fibroma of bone, with emphasis on its morphological relationship to benign chondroblastoma. *Cancer*. 1956;9(1):195-203.
17. Robbin MR, Murphey MD. Benign chondroid neoplasms of bone. *Semin Musculoskelet Radiol*. 2000;4(1):45-58.
18. Downey EF, Brower AC, Holt RB. Case report 243. Cortical ossifying lipoma of femur. *Skeletal Radiol*. 1983;10(3):189-191.
19. Milgram JW. Intraosseous lipomas. A clinicopathologic study of 66 cases. *Clin Orthop*. 1988;(231):277-302.
20. Yamamoto T, Marui T, Akisue T, et al. Intracortical lipoma of the femur. *Am J Surg Pathol*. 2002;26(6):804-808.
21. Murphey MD, Carroll JF, Flemming DJ, Pope TL, Gannon FH, Kransdorf MJ. From the archives of the AFIP: benign musculoskeletal lipomatous lesions. *Radiographics*. 2004;24(5):1433-1466.
22. Bush JB, Sweeney JP, Robison JE, DeMoss B, Meyer MS. Chondromyxoid fibroma of the radial shaft treated with nonvascularized fibular autograft. *Am J Orthop*. 2010;39(1):30-34.

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