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Case Report

Liposarcoma of the thigh with mixed calcification and ossification

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ABSTRACT

Liposarcoma is one of the most common soft-tissue sarcomas. Calcification and ossification can occur in liposarcoma; however, the presence of both ossification and calcification is a very rare entity. We present a case of a partially calcified and ossified dedifferentiated liposarcoma of the thigh in a 76-year-old woman, which contained heterologous elements of chondrosarcoma and rhabdomyosarcoma.

Case report

A 76-year-old woman presented for evaluation of asymmetrically enlarged left thigh mass noticed by a home health provider in August 2015. The patient had not noticed the asymmetry herself but did report severe left thigh pain 2 months before presentation. Her mobility was limited by pain necessitating use of a walker or wheelchair. She denied preceding injury or trauma. Medical history was significant for stroke in 1998, hypertension, and hyperlipidemia.

In August 2015, multimodality imaging assessment of the left thigh was performed. Plain radiography (Fig. 1) demonstrated a complex mass in the anterior thigh with proximal fatty and distal soft-tissue components. The predominantly fatty component contained mature ossification, whereas the soft-tissue component contained amorphous calcification. Focal erosion of the anterior cortex of the distal femoral diaphysis in the region of the soft-tissue component was present. Computed tomography (CT) of the left thigh without intravenous contrast (Fig. 2) performed at an outside institution demonstrated a complex mass in the anterior compartment of the left thigh measuring 11 × 7 × 24 cm. The mass contained a lipomatous component proximally and a large soft-tissue component distally. The

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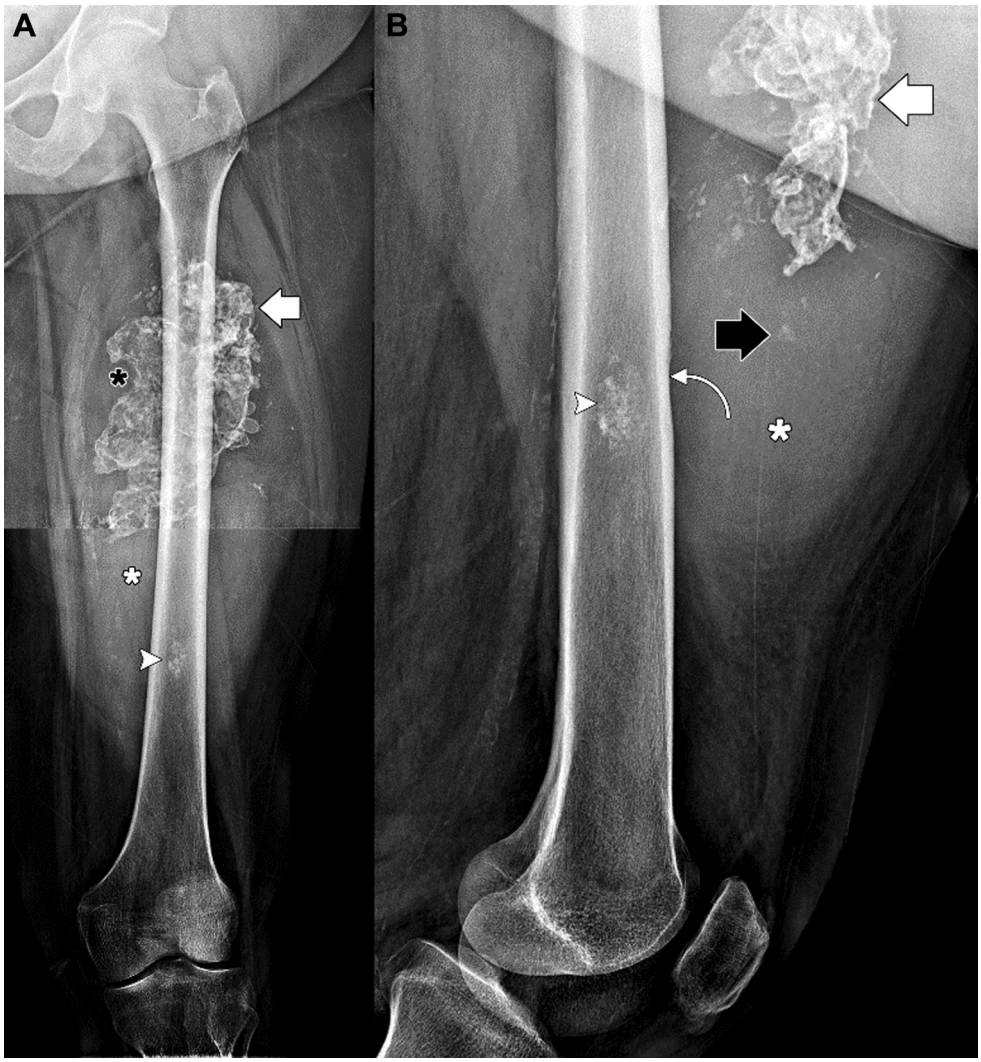

Fig. 1 – Composite anteroposterior (A) and magnified lateral (B) views of the left femur show a complex mass with proximal fatty (black *) and distal soft-tissue (white *) components. The predominantly fatty component has mature ossification (white arrows), whereas the soft-tissue component has amorphous calcification (black arrow). There is focal erosion of the anterior cortex of the distal femoral diaphysis (curved arrow) in the region of the soft-tissue component. An intramedullary lesion with chondroid matrix calcification (white arrowhead) represents an incidental enchondroma.

lipomatous component contained areas of mature ossification, and the soft-tissue component contained scattered amorphous calcifications. Subtle erosive changes were present along the midfemoral diaphyseal cortex. Magnetic resonance imaging (MRI) without and with intravenous contrast (Fig. 3) performed at an outside institution demonstrated the mass in the anterior compartment of the left thigh with a lipomatous component with thick enhancing septations proximally and a solid enhancing component distally. Central areas of low signal within the lipomatous component corresponded to the areas of ossification identified on CT.

Late in August 2015, the patient was referred to our institution for additional workup and treatment. Fine-needle aspiration of the distal, solid component performed in September 2015 was reported as high-grade sarcoma possibly dedifferentiated liposarcoma. Core needle biopsy of the solid component on the following day was reported as high-grade spindle-cell sarcoma with suggestion of dedifferentiated liposarcoma. In October 2015, the patient underwent radical resection of the tumor with pathology demonstrating dedifferentiated liposarcoma with heterologous elements of chondrosarcoma and rhabdomyosarcoma.

The patient had an extended recovery and rehabilitation after surgical resection. Because of the patient's socioeconomic situation, she opted to initially forego treatment with chemotherapy. Her first staging CT of the chest performed in September 2015 was negative for metastatic disease; however, a follow-up CT of the chest in January 2016 demonstrated multiple new pulmonary nodules consistent with metastases. The patient is now scheduled to begin single-agent chemotherapy with doxorubicin.

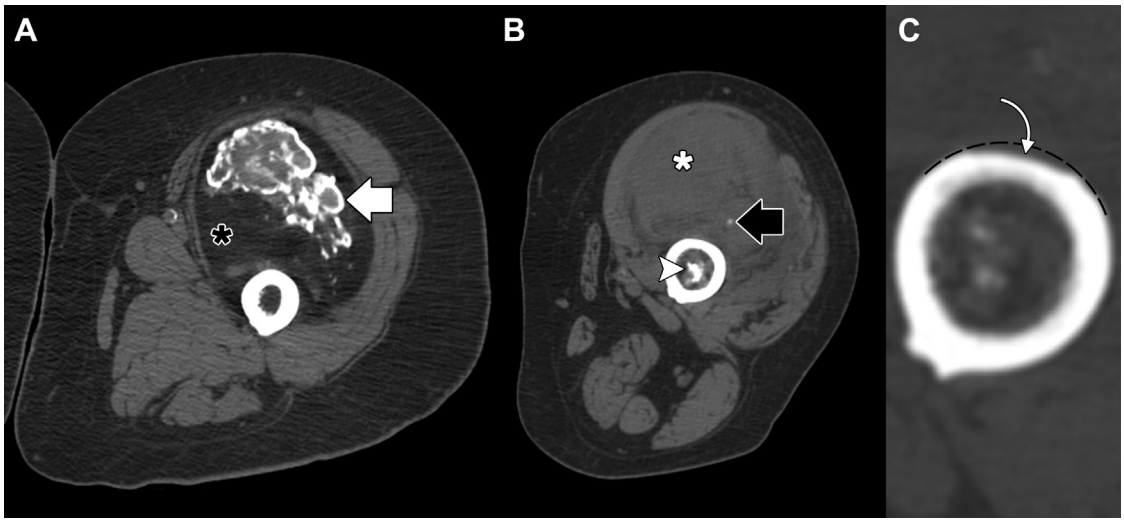

Fig. 2 – Axial noncontrast CT images through the proximal (A) and distal (B) portions of the lesion show a complex mass with fatty (black *) and soft-tissue (white *) components. The predominantly fatty component has mature ossification (white arrow), whereas the soft-tissue component has amorphous calcification (black arrow). An intramedullary lesion with chondroid matrix calcification (white arrowhead) represents an incidental enchondroma. (C) There is subtle focal erosion of the anterior cortex of the distal femoral diaphysis (curved arrow) in the region of the soft-tissue component, which can be seen more clearly when compared with expected contour of the femur (dotted line).

Discussion

Liposarcoma is defined as a malignant mesenchymal neoplasm that is composed of lipogenic tissue with a varying degree of cellular atypia, possibly including nonlipogenic sarcoma cells [1]. Liposarcoma represents 12.8% of all sarcomas, specifically, 24% of all extremity and 45% of all retroperitoneal soft-tissue sarcomas [1]. The peak age of onset is in the fifth to seventh decades [2].

Liposarcoma has a wide range of histopathology and clinical behavior necessitating subtyping, which is crucial for

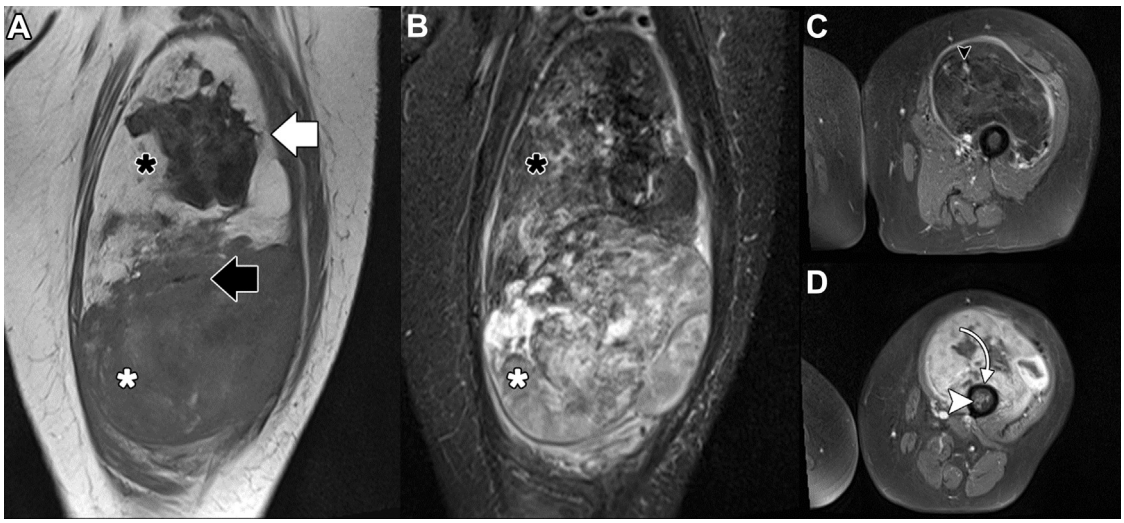

Fig. 3 – MRI assessment of the left thigh lesion using coronal T1-W (A) and short tau inversion recovery (B) sequences and axial postcontrast images through the proximal (C) and distal (D) portions of the lesion. Again seen is a complex mass with fatty (black *) and soft-tissue (white *) components. Low-signal area in the proximal component corresponds to ossification (white arrow), whereas the soft-tissue component has subtle areas of low signal (black arrow) that correspond to amorphous calcifications seen on conventional radiographs and CT. Postcontrast images demonstrate a relatively thick enhancing capsule and septal and nodular (black arrowhead) enhancing components in the proximal, predominantly fatty portion (C) and a heterogeneously enhancing distal component (D) with central necrosis that results in subtle erosion of the anterior cortex of the distal femoral diaphysis (curved arrow). An intramedullary lesion with chondroid matrix calcification (white arrowhead) represents an incidental enchondroma.

clinical decision making and prognosis. The 4 main subtypes of liposarcoma currently used in clinical practice consist of well-differentiated liposarcoma and/or atypical lipomatous tumor; dedifferentiated liposarcoma; myxoid liposarcoma and/or round-cell liposarcoma; and pleomorphic liposarcoma [1]. Dedifferentiated liposarcoma is the least common type of liposarcoma accounting for about 5% of all liposarcoma cases [1]. Well-differentiated liposarcoma and/or atypical lipomatous tumor and dedifferentiated liposarcoma are considered to be along the same spectrum of disease with dedifferentiated liposarcoma arising from within well-differentiated liposarcoma and/or atypical lipomatous tumor with a mean time to dedifferentiation of 7-8 years after diagnosis of well-differentiated liposarcoma and/or atypical lipomatous tumor [3,4]. Overall, about 10% of well-differentiated liposarcoma will undergo dedifferentiation [3,5]. Dedifferentiated liposarcoma is inherently more aggressive and more likely to metastasize than well-differentiated liposarcoma and/or atypical lipomatous tumor with dedifferentiated liposarcoma having distant metastases in 15%-20% of cases with lungs and liver being most common [6].

Imaging is a crucial tool in the evaluation of a lipomatous mass. Usually, characterization with CT and MRI is sufficient to allow the distinction between a lipoma and liposarcoma. However, there are cases in which distinguishing between a lipoma and well-differentiated liposarcoma and/or atypical lipomatous tumor can be a diagnostic dilemma. A lipoma with typical imaging characteristics including homogeneous fatty attenuation on CT and homogeneous fatty signal intensity in all pulse sequences on MRI are usually easy to identify [7]. However, a dilemma arises when a lipomatous mass contains nonlipomatous components, such as septations, nodularity, or calcifications. Prior studies have suggested that CT and MR imaging features of a predominantly fatty mass with thick septations (>2 mm) and/or nodular soft-tissue elements (<1 cm) is more typical for well-differentiated liposarcoma and/or atypical lipomatous tumor [5,6,8]. If the mass contains a focal soft-tissue nodule >1 cm, this becomes even more suggestive of dedifferentiation. In fact, dedifferentiated liposarcoma will often have large nonlipomatous components [5,6,8]. In our case, the presence of a lipomatous mass with a large enhancing soft-tissue component and erosive changes along the femoral diaphysis are features of a more aggressive neoplasm beyond just a simple lipoma or even well-differentiated liposarcoma.

Heterologous differentiation can be seen in about 10% of cases of dedifferentiated liposarcoma with several possible types of heterologous elements including rhabdomyosarcoma, leiomyosarcoma, chondrosarcoma, or osteosarcoma [3,9]. O'Regan et al. [6] mention the presence of calcification on imaging may suggest osteosarcomatous dedifferentiation. A small number of case reports in the literature have described dedifferentiated liposarcoma with osteosarcomatous elements. Toms et al. [10] reported a case of a 78-year-old woman with gluteal dedifferentiated liposarcoma with osteosarcomatous elements. The mass was described as fat attenuation with a central soft-tissue component containing multiple amorphous areas of calcification and/or ossification. As mentioned, our presented case demonstrated areas of ossification and calcification; however, heterologous elements of osteosarcoma were not reported.

Multiple different types of soft-tissue calcifications exist with certain features favoring a particular diagnosis. In general, the differential for soft-tissue calcifications is broad. Banks et al. [11] described a compartmental approach to the radiographic evaluation of soft-tissue calcifications. In the case of a mass containing fatty elements and calcifications the differential predominantly includes hemangioma, heterotopic ossification, fat necrosis, lipoma, liposarcoma, or other benign lipomatous tumors (angiolipoma, myolipoma, chondroid lipoma, lipoblastoma, spindle-cell and/or pleomorphic lipoma, hibernoma) [12].

Calcification or metaplastic ossification has been reported in 10%-32% of well-differentiated liposarcoma and dedifferentiated liposarcoma [5]. Calcification can also occur in lipomas; however, it tends to occur more often in liposarcoma, with Kransdorf et al. [13] reporting 32% of liposarcoma cases containing calcification and 11% of lipomas containing calcification. Tuoheti et al. [14] described a case of a 17-year-old with a lower leg mixed low-grade and high-grade liposarcoma containing multiple punctate calcifications having imaging characteristics more suggestive of a hemangioma. The typical radiographic appearance of calcifications in a hemangioma are described as phleboliths, which are round densities with a central lucency ranging from 2 to 8 mm in size [11]. Kransdorf et al. [13] reported 4 cases of dedifferentiated liposarcoma of which amorphous calcification and a single punctate calcification were observed in two of them. In our case, the more proximal, predominantly fatty lesion had mature ossification radiographically, whereas the mineralization of the dedifferentiated, distal component had a more amorphous appearance, as reported by Kransdorf et al. [13].

In summary, we presented a unique case of a partially calcified and ossified dedifferentiated liposarcoma demonstrating heterologous elements of chondrosarcoma and rhabdomyosarcoma. The mass contained large areas of ossification in the lipomatous component and more scattered amorphous calcifications in the dedifferentiated soft-tissue component. Interestingly, the pathology demonstrated heterologous elements of chondrosarcoma and rhabdomyosarcoma. Perhaps in cases of partially calcified dedifferentiated liposarcoma, not only may this suggest heterologous elements of osteosarcoma but may also suggest elements of chondrosarcoma. Additional studies are warranted to confirm this observation.

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