CASE REPORT

Collision tumor of bone: primary chondrosarcoma of bone as a rare recipient of tumor-to-tumor metastasis from metastatic breast carcinoma

Wesley S. Greer[1], Jerad M. Gardner[2], Corey O. Montgomery[1]

1. Department of Orthopaedic Surgery, University of Arkansas for Medical Sciences, Little Rock, USA. 2. Department of Pathology, University of Arkansas for Medical Sciences, Little Rock, USA.

Correspondence: Wesley S. Greer. Address: 4301 W Markham St, Slot 531, Little Rock, USA. E-mail: wsgreer@uams.edu

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Abstract

Collision tumors are the rare phenomenon of two histologically distinct tumors occurring in the same anatomic location. We report an unusual case of metastatic breast carcinoma colliding with primary grade 1 chondrosarcoma in the femur of a 58-year-old female.

Key words

Collision tumor, Chondrosarcoma, Breast carcinoma, Bone metastasis, Tumor to tumor metastasis

1 Introduction

Collision tumors represent the rare phenomenon in which two or more distinct and unrelated tumors reside concurrently in one location as either both primary tumors [1], one primary and one metastatic tumor (also known as "tumor to tumor metastasis") [2] or both metastatic tumors [3]. We report an unusual case of a collision tumor involving metastatic breast adenocarcinoma and primary grade 1 chondrosarcoma occurring in the femur of a 58-year-old female patient.

2 Case presentation

A 58-year-old female was referred to our institution for evaluation of a distal femoral shaft lesion. She had a history of inflammatory breast cancer (Stage IIIB) that was diagnosed and treated in 2007 but had recently recurred with development of a malignant pleural effusion found in 2014. She had a several week history of progressive femoral pain and discomfort. On physical examination, tenderness was noted in the area of the lesion but no palpable mass could be felt. Range of motion of the knee was limited and painful.

Radiographs demonstrate an 8 cm × 3 cm lesion in the distal femur with intralesional calcifications and endosteal scalloping (see Figure 1). An MRI of the femur revealed a heterogeneous lobulated lesion with medial wall cortical thinning/erosion with surrounding soft-tissue edema (see Figure 2). Both the plain films and MRI findings were concerning for chondrosarcoma.

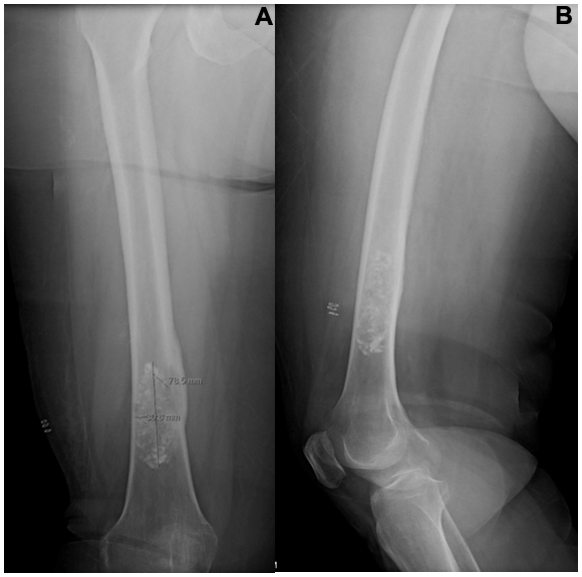

Figure 1. AP (1A) and lateral (1B) x-ray views of the right femur demonstrate a distal femoral shaft bone lesion in the intramedullary canal with a focus of dense stippled calcification, measuring approximately 8 cm × 3 cm, along with medial cortical wall erosion.

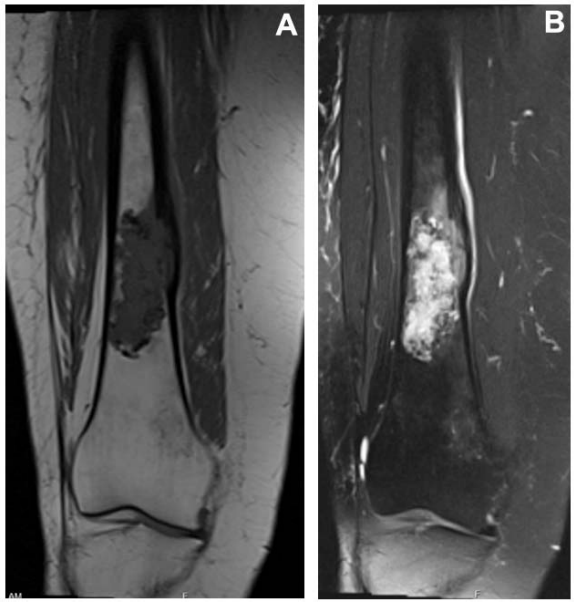

Figure 2. Coronal T1 and T2 MRI views of the right femur. T1 images (2A) demonstrate a low signal intensity mass with associated medial cortical wall thinning. T2 images (2B) demonstrate a higher signal intensity with intralesional heterogeneity consist with a cartilage neoplasm. No overt cortical wall erosion or soft-tissue mass was noted.

A whole body bone scan (see Figure 3) was performed showing uptake in the lumbar spine, ribs, and the femoral shaft. An open biopsy of the distal femur lesion was performed and was histologically consistent with a grade 1 chondrosarcoma. After discussion with the patient, she underwent an intralesional curettage with placement of bone cement along with plate and screw fixation for treatment. Final pathology on this curettage specimen displays grade 1 chondrosarcoma as well as metastatic breast adenocarcinoma directly adjacent to the chondrosarcoma (see Figure 4).

3 Discussion

There are many descriptions in the literature of various colliding tumors presenting in a wide range of anatomic locations. Some of the many locations of development include the skin [4], stomach [5], kidney [6], bladder [7] and brain [8]. Not only have collision tumors been documented to arise in various anatomic locations, but they have been documented to arise as both benign tumors [9], benign/malignant tumors [7] and both malignant tumors [5]. Also, collision tumors primarily consist of two colliding tumors, but rare collision tumors consisting of three tumors have been described in the skin [10, 12] and uterus [11] as well.

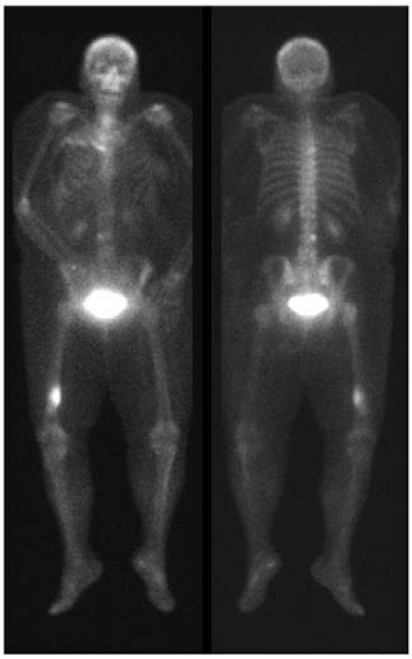

Figure 3. Multiple areas of osseous uptake in the thoracolumbar spine and right distal femoral shaft are seen on bone scan

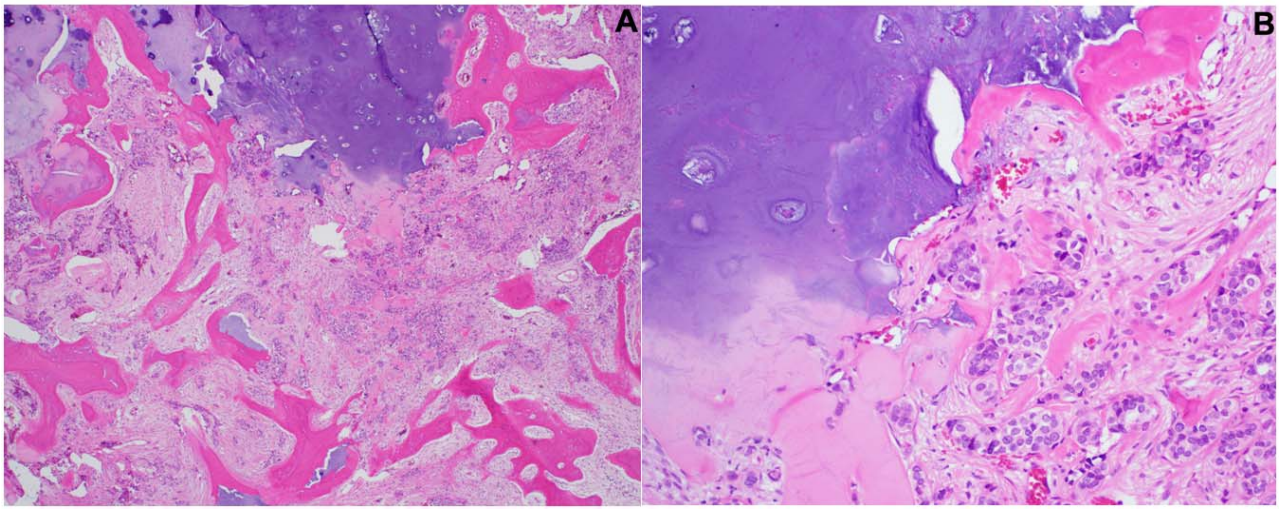

Figure 4. On low power examination (4A), blue nodules of relatively mature cartilage are seen at the top of the field with adjacent pink islands of reactive bone formation. In the center of the field are numerous small nests of metastatic carcinoma with extensive background fibrosis and desmoplasia (H&E stain; 40× magnification). Higher power (4B) clearly displays chondrosarcoma (upper left) directly abutting the small infiltrative nests of metastatic breast adenocarcinoma (lower right) (H&E stain; 200× magnification).

Collision tumors when involving the bone are relatively rare and have not been described involving more than two tumors. When discussing primarily osseous collision tumors, Smith *et al.* reported three cases of osteosarcoma developing adjacent to enchondroma [13]. Sanerkin *et al.* reported six cases of high grade osseous sarcomas arising next to enchondroma [14]. More recently, Galvin *et al.* reported one case of metastatic carcinoma to an enchondroma [15]. Our literature review identified only one other report of a metastatic adenocarcinoma colliding with chondrosarcoma: this was a collision tumor consisting of grade 1 chondrosarcoma and metastatic adenocarcinoma presenting in the scapula [16].

Before making a diagnosis of a collision tumor between a carcinoma and a sarcoma histologically, the possibility of sarcomatoid carcinoma must first be excluded. Sarcomatoid carcinoma is a form of poorly differentiated carcinoma in

which all or part of the tumor is composed of malignant spindle cells resembling a sarcoma. The sarcomatous component may sometimes resemble specific histologic subtypes of sarcoma, including osteosarcoma and chondrosarcoma (so-called "heterologous differentiation"). Unlike the well differentiated cartilage present in our case, the chondrosarcomatous component of a sarcomatoid carcinoma would typically be markedly atypical and high grade histologically. Additionally, the known history of widely metastatic breast carcinoma and absence of any history of a primary sarcomatoid carcinoma elsewhere in this patient are further findings that strongly argue against the possibility sarcomatoid carcinoma in our patient.

Chondrosarcoma is a malignant cartilage tumor which can occur as a primary tumor or as a secondary tumor arising from a pre-existing benign cartilage neoplasm. Pain, which is uncommon in benign enchondromas, is often a presenting complaint in both low and high grade chondrosarcoma. Radiographically, chondrosarcoma typically demonstrates endosteal scalloping, cortical disruption, and extension into adjacent soft tissue, features that help distinguish it from benign cartilage tumors [17]. Dedifferentiated chondrosarcoma occurs when a high grade undifferentiated-appearing (non-cartilaginous) sarcoma arises out of an adjacent typical chondrosarcoma [17].

Low grade cartilaginous neoplasms are notoriously difficult to diagnose by histologic features only, as grade 1 chondrosarcoma can have histologic features nearly identical to enchondroma. Clinical and radiographic correlation are essential in distinguishing between these two entities. In our patient, the radiographic and MRI findings were more suggestive of chondrosarcoma than enchondroma. The treatment options for low grade chondrosarcoma include intralesional curettage, adjuvant therapy (argon beam) and cementation, or wide excision [18]. Plate fixation is sometimes added when osseous large voids are present after intralesional curettage. Metastatic carcinoma was only identified in the curettage specimen in our patient and was not present in the initial biopsy. However, as intralesional curettage with adjuvant therapy and cementation has been demonstrated to be an effective treatment for osseous metastatic disease, this unexpected finding in the curettage specimen did not alter our surgical management of the patient [19].

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