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Multicentric Epithelioid Hemangioendothelioma of the Bone: Histologic and Radiographic Features

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A multicentric epithelioid hemangioendothelioma (EHE) of the bone is reported which affected the right femur, the right patella and the right fibula of a 56-year-old man. Plain radiographs demonstrated purely lytic multicentric lesions with well-defined sclerotic borders. Computed tomography (CT) scans showed multiple osteolytic lesions in a honeycomb pattern at the epiphyseal lesion of the right femur; the other lesions of the right femoral shaft, the right patella and the right fibula were punched out sharply. Magnetic resonance (MR) images showed that the tumors contained mixed signal intensities: low intensity for T1-weighted images and high intensity for T2-weighted images. Histologically, the tumor was discerned as EHE with a spectrum of endothelial tumor, with the added feature of epithelioid hemangioma in a limited area. As for the initial treatment, curettage and bone cementing were performed for the epiphyseal tumor of the right femur, followed by surgical resections of the other tumors. Neither recurrence nor metastasis was observed 3 years after resection.

Key words: bone tumor; epithelioid hemangioendothelioma; histology; multiple; radiography

Weiss and Enzinger (1982) first described epithelioid hemangioendothelioma (EHE) as a unique tumor of the soft tissue, and proposed it as a counterpart to the vascular tumor associated with epithelioid or histiocytoid cells: the tumors are well known as lesions in the liver, the lung and other organs. EHE of the bone, however, rarely occurs and reported cases have totaled up to less than 80 (Hartmen and Stewart, 1962; Otis et al., 1968; Maruyama et al., 1985; Mirra and Kameda, 1985; Tsuneyoshi et al., 1986; Lyon et al., 1992; Abati et al., 1994; Bollinger et al., 1994; Boutin et al., 1996), including 29 cases reported by Tsuneyoshi et al. (1986) and a series of 40 cases by Kleer et al. (1996).

EHE appears in a unilocular or multicentric manner histologically with features of large, polygonal cells with intracytoplasmic vacuolization, fibromyxoid stroma and well-formed vascular channels at varying degrees (Tsuneyoshi et al., 1986; Weiss et al., 1986). EHE of the soft tissue takes various clinical courses from benign to malignant; the malignancy is defined as intermediate by WHO classification (World Health Organization, 1993). EHE should be distinguished from benign vascular tumors though difficulty exists in differentiation among epithelioid tumors (Keel and Rosenberg, 1999). Local recurrence and metastasis were reported to be 13% and 31% in incidence, respectively (Weiss et al., 1986).

We here report a case of multicentric bone tumor that fits the category of EHE, with special reference to radiographic features.

Abbreviations: CT, computed tomography; EHE, epithelioid hemangioendothelioma; MR, magnetic resonance

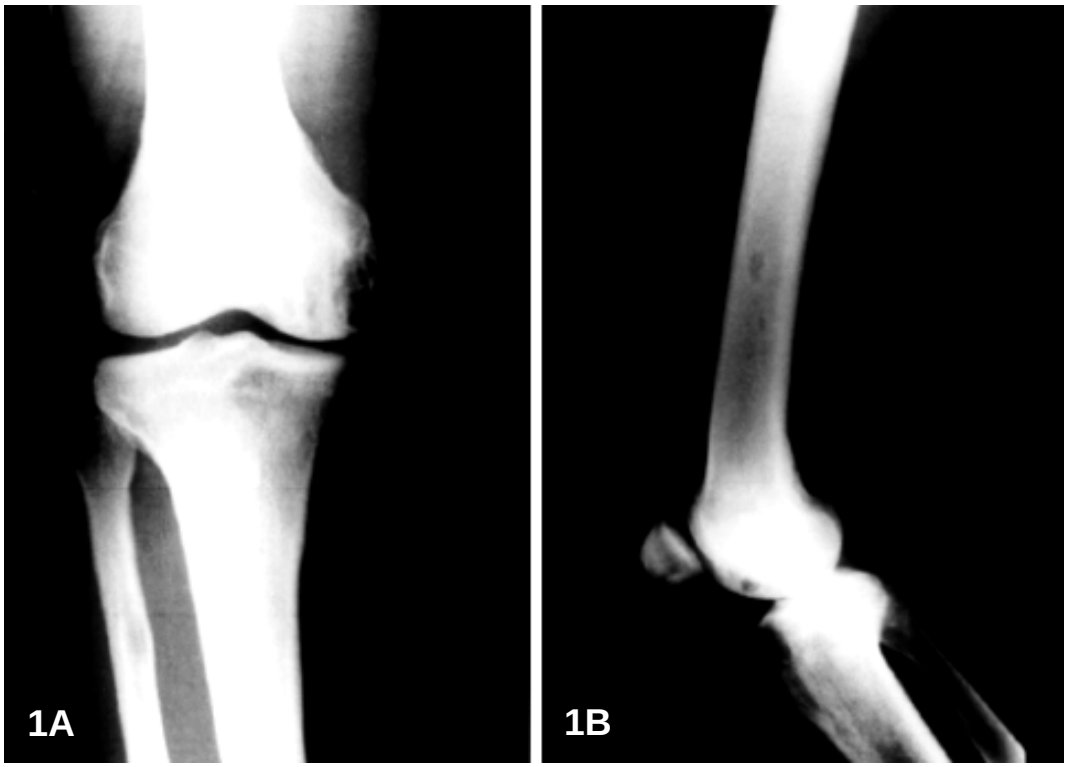

Fig. 1. Plain radiographs. **A:** Lesions in a honeycomb pattern in the epiphysis of the right femur and in the right fibula. **B:** In the lateral view, lesions of the right femoral shaft, the right epiphysis and the right patella are punched out.

Patient Report

A 56-year-old man visited Tottori Red Cross Hospital with a 1-month history of a spontaneous pain in his right knee joint in December 1996. No history of trauma to the thigh was noted. Physical examination on admission revealed tenderness to palpation without any mass. In plain radiographs, anteroposterior and lateral views demonstrated multiple radiolucent lesions in a honeycomb pattern in the distal epiphysis of the right femur, the right fibula and the right femoral shaft (Figs. 1A and B). Computed tomography (CT) scans showed an osteolytic area with marginal sclerosis in the epiphyseal lesion of the right femur; the other lesions of the right femoral shaft, the right patella and the right fibula were all sharply punched out (Figs. 2A and B). The tumors contained mixed signal intensities in magnetic resonance (MR) images: the intensity was low in T1-weighted images, and high in T2-weighted images (Figs. 3A and B). Technetium bone scan revealed increased uptakes of isotopes at the lesions of the right femur, the right patella and the right fibula (Fig. 4). Histologic examination was carried out for biopsy specimens tentatively suspected of having an EHE. For the initial treatment, curettage and bone cementing were employed for the epiphyseal tumor of the right femur, and then the other lesions of the patella and the fibula were surgically resected.

The surgically obtained specimens were examined and histologically defined as multicentric bone tumor which satisfies the category of EHE. The tumors forming nests in the growth pattern consisted of accumulated epithelioid cells, with various-sized vasculatures of the capillary type (Fig. 5). Epithelioid cells

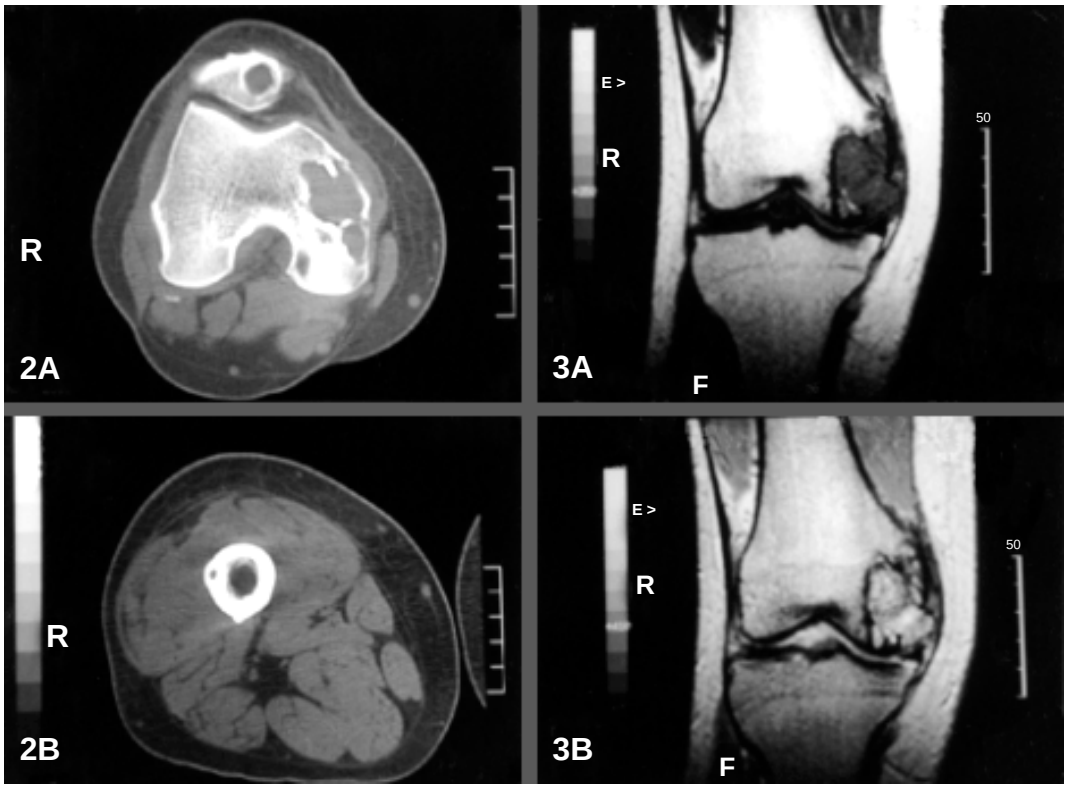

Fig. 2. Computed tomography (CT) scans. **A:** Well-defined, osteolytic lesions with a thin sclerosing margin in the right femur and the patella. **B:** Intracortical lesion of the right fibula.

Fig. 3. Magnetic resonance (MR) images. **A:** T1-weighted image shows low signal intensity in the right femoral tumor, which is close to the skeletal muscle. **B:** In T2-weighted image, the intensity of the right femoral tumor is high.

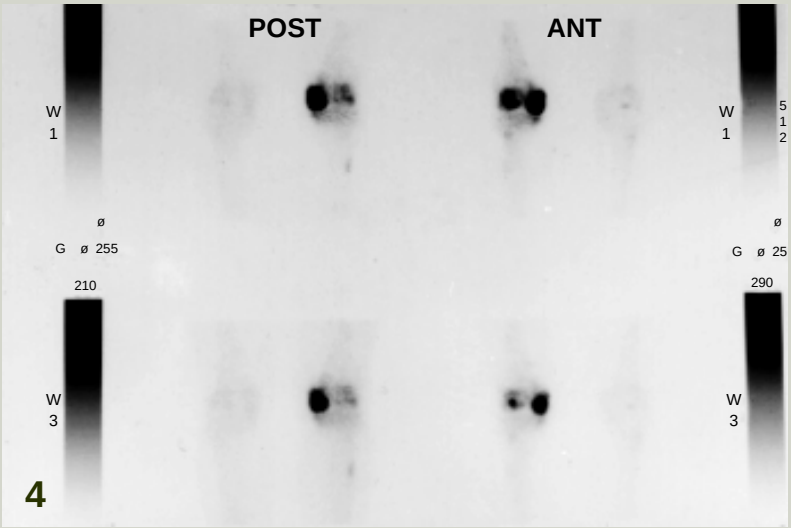

Fig. 4. Technetium bone scan shows increased uptakes of isotopes in the lesions of the right femur, the right patella and the right fibula.

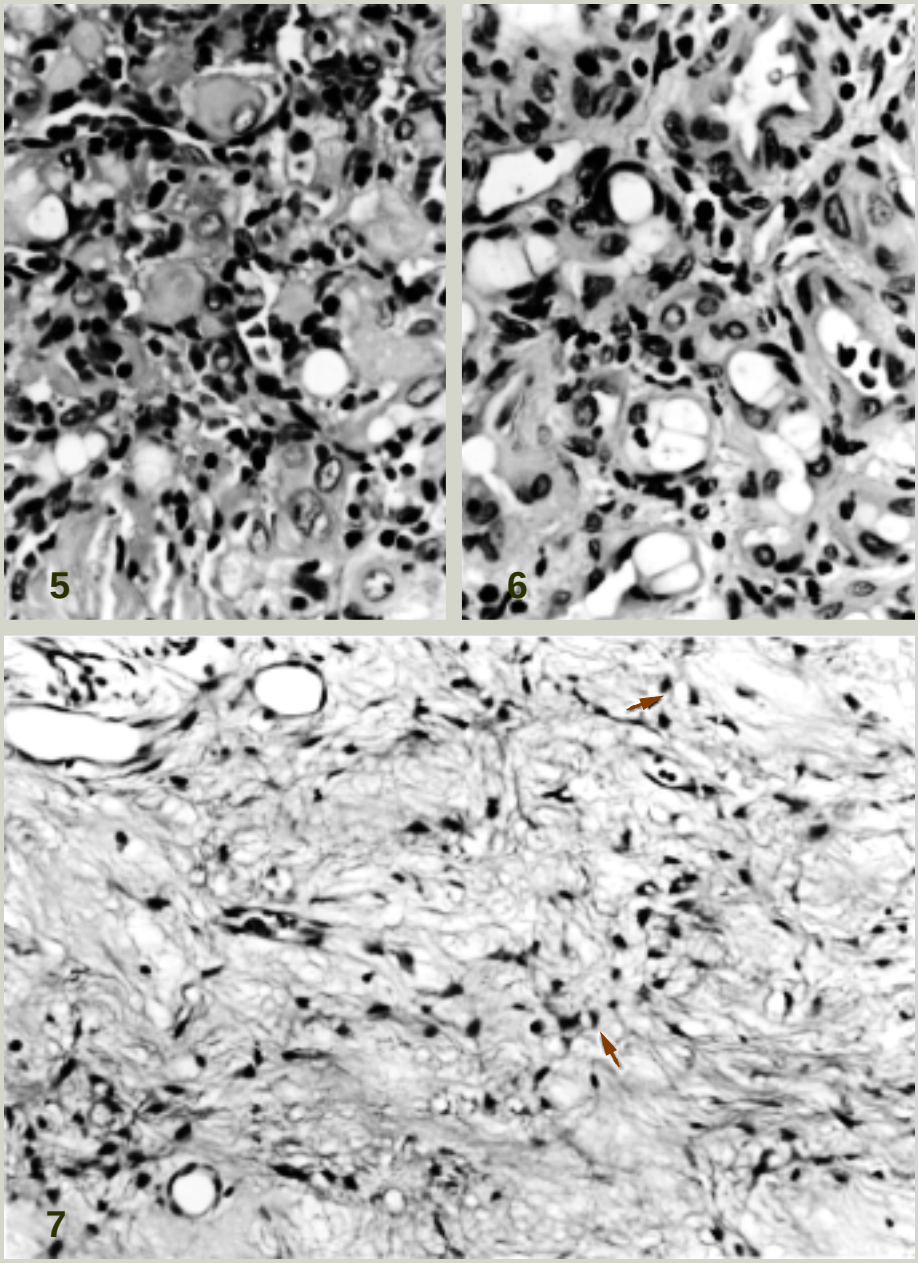

Fig. 5. The tumor consists of an accumulation of epithelioid cells forming nests in the growth pattern with capillaries.

Fig. 6. Epithelioid cells showing abundant, eosinophilic cytoplasms with intracytoplasmic vacuoles in various stages. The vascular channel is lined by large, plump tumor cells with an aggregation of epithelioid cells outside.

Fig. 7. A fibromyxomatous stroma provides the background. The tumor cells (arrow) with vacuoles are arranged in a cord-like pattern.

showed an abundant, eosinophilic cytoplasm often with various-sized intracytoplasmic vacuoles. The vascular channel was lined by large, plump tumor cells with an aggregation of epithelioid cells outside (Fig. 6). Mitotic figures were scarcely observed in all 4 lesions. A fibromyxomatous stroma provided as the background in a large area taken from the tumors of the patella and the fibula; in the fibromyxomatous stroma, the tumor cells with cytoplasmic vacuoles were arranged in a cord-like pattern (Fig. 7). Lymphocytic aggregation was scarce in the stroma in a limited area. We performed immunohistochemical examination for Factor VIII-related antigen and CD34 with monoclonal antibodies, and detected strongly positive reactions from the tumor cells including the vacuolating cells.

Discussion

The diagnostic term EHE was introduced for unusual bone and soft-tissue tumors as a counterpart to vascular tumors, similar to those originating in the visceral organs with a 1% incidence among all vascular tumors (Weiss and Enzinger, 1982; Costa et al., 1996; Keel and Rosenberg, 1999). EHE is histologically characterized by clusters of epithelioid cells with various-sized vasculatures in the background of myxoid or fibrous stroma (Weiss and Enzinger, 1982; Maruyama et al., 1985; Tsuneyoshi et al., 1986; Bollinger et al., 1994). The epithelioid cells frequently show various-sized intracytoplasmic vacuoles, which mimicked a primitive vascular channel: positive reactions for Factor VIII-related antigen and CD34 and the presence of Weibel-Palade granules proved that the epithelioid cells have a distinctive nature among endothelial cells (Tsuneyoshi et al., 1986). In the present patient, the tumors were initially observed to consist of clusters of epithelioid cells which had vacuoles compatible to the primitive blood vessels. The cord-like arrangement of CD34-positive, vacuolated cells was also recognized in the fibromyxoid matrix, which clearly indicated EHE as mentioned by Weiss and Enzinger (1982). Epithelioid cells were accumulated in a small area around the well-developed vascular channel, which mimicked epithelioid hemangioma. Initially, EHE was proposed as one type of vascular tumor with epithelioid cells including epithelioid hemangioma and epithelioid angiosarcoma (Weiss et al., 1986). Epithelioid hemangioma takes a benign clinical course, and is often mistaken for EHE (O'Connell et al., 1993; Costa et al., 1996).

On plain radiographs, EHE appears solitarily or multicentrically, being purely lytic and expansive with well-defined sclerotic borders, as in benign vascular tumors (Tsuneyoshi et al., 1986). A coarse trabecular or honeycomb pattern is also common, but is rarely seen with a destruction pattern in the elderly (Bollinger et al., 1994), as Murphy et al. (1995) suggested. In pulse sequences emphasizing a T1 contrast, bone tumors of a vascular origin show higher intensities than skeletal muscles but lower than fat; while in pulse sequences emphasizing a T2 contrast, signal intensities of bone tumors of a vascular origin are significantly higher than muscles and fat (Boutin et al., 1996). In the present patient, signal intensity of the epiphyseal tumor of the right femur was close to that of muscles in T1-weighted images, whereas in T2-weighted images, the intensity of the bone tumor was higher than that of muscles and with well-defined margins.

EHE of the bone is generally categorized as a tumor of intermediate malignancy, slowly growing with initial symptoms of pain and local swelling. The clinical course of EHE of the bone depends on the degree of tumor malignancy, between an epithelioid hemangioma and an epithelioid angiosarcoma. It is most likely that cancellous bone and cortical bone of the lower extremities are involved in EHE (Boutin et al., 1996). In EHE, lesions appear in a multicentric manner with an incidence of over 50% and below 62%, particulary with a predilection for bones of the lower extremities in one anatomic region (Bollinger et al., 1994). Bones of the upper extremities, ribs, vertebrae and scapulae might be also involved in EHE, though the incidence would be lower (Tsuneyoshi et al., 1986). The multicentric type of EHE seems to

take a benign course in affected regions, but is more indolent than the solitary type (Kleer et al., 1996; Weiss et al., 1986). EHE associated with cutaneous and visceral organs gives a serious influence on the clinical course (Kleer et al., 1994). Therefore, CT scanning and MR imaging should be employed in predicting the prognosis of vascular tumors for a thorough examination of a patient.

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