

## Epithelioid Hemangioendothelioma of the Distal Radius: A Case Report

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Epithelioid hemangioendothelioma is a rare vascular tumor with cytologic behavior between angiosarcoma and hemangioma. We present the case of a 58-year-old male with primary epithelioid hemangioendothelioma of the distal radius measuring 6.2 x 5 cm with extension into the pronator quadratus and brachioradialis muscles. We discuss our approach to performing a limb-sparing resection combined with reconstruction to preserve upper extremity function. A review of the clinical, radiographic, and pathologic features of epithelioid hemangioendothelioma is also presented.

### Introduction

Hemangioendotheliomas represent a type of vascular tumor with cytologic behavior that is in between an angiosarcoma and hemangioma. There is variability in the predilection of these tumors to recur and metastasize. The histologic diagnosis of epithelioid hemangioendothelioma (EH) is difficult to differentiate from other vascular tumors, epithelioid tumors, or histiocytic tumors [1, 2].

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Abbreviations: EH, epithelioid hemangioendothelioma; CT, computed tomography; MRI, magnetic resonance imaging

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However, their aggressive and malignant behavior makes distinguishing this particular histologic subtype paramount.

Patients commonly present with nonspecific signs and symptoms, most commonly pain and swelling; few present with pathologic fractures [3]. The highest incidence of EH occurs in the second decade, with multicentric disease present in 55% of patients [4]. Previous series have reported that EH occurs at an earlier age than other vascular tumors of bone [4, 5]. Theoretically, these lesions can arise from any vascularized structure, but have a predilection for lung, liver, and soft tissues of the extremity.

Epithelioid hemangioendothelioma typically involves a single anatomic region or extremity, although multiple bones may be involved in 40% of cases [4]. When the upper extremity is involved, the humerus is the most common location. Radiographically, EH classically produces a lytic lesion on plain films. Cortical destruction and cortical expansion are infrequently seen [3]. Non-osseous soft tissue masses present in up to 40% of cases, although the majority of lesions are restricted to bone [6]. The aggressive radiographic characteristics of EH raises the possibility of a malignant lesion in the differential diagnosis.

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### Case Report

The patient is a 58-year-old right-hand dominant male, who was referred to our institution for evaluation of a right forearm mass. The patient described vague forearm pain and swelling that began three months prior. He otherwise denied numbness, weakness, or functional loss of the hand. The patient subsequently fell and fractured his distal radius at the site of the swelling. Plain radiographs revealed an associated lytic lesion. He was treated at an outside institution for the pathologic fracture. An incisional biopsy of the mass was inconclusive.

Neurovascular examination on presentation revealed a normal distal extremity and a well-healed biopsy incision. Past medical history was significant for diabetes and dialysis-dependent renal failure with subsequent kidney transplantation in 2001. His laboratory studies were otherwise unremarkable. Plain radiographs demonstrated an expansile lesion within the distal one-third of the radius (Figure 1).

Magnetic resonance imaging was obtained to delineate bone and soft tissue involvement. The lesion demonstrated a heterogeneously enhancing, aggressive-appearing lesion (Figure 2).

Ultrasound guided biopsy was performed. An 18-gauge



Figure 1. Preoperative oblique radiograph of the right distal forearm demonstrating an epithelioid hemangioendothelioma. A lytic, septated, expansile lesion is present without identifiable matrix. A pathologic fracture is visible along the radial border.

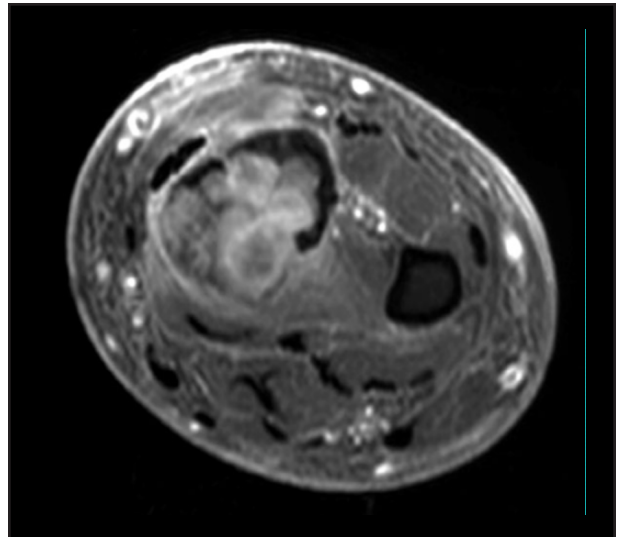


Figure 2. Sagittal (A, left) and axial (B, above) T1-weighted fat suppressed MR images with gadolinium enhancement demonstrate a heterogeneously enhancing, aggressive lesion that traverses the bone cortex and is encased by the pronator quadratus and brachioradialis muscles.

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BioPince core biopsy was initially utilized, but the amount of tissue obtained was inadequate. Subsequently, a Bonopty needle set was utilized. The needle was advanced from the area of previous incisional biopsy into a V-shaped area of cortical disruption and the drill was then advanced about 5mm. Three passes were made through this zone with the inner biopsy needle. This biopsy specimen demonstrated epithelioid hemangioendothelioma.

Regarding bone reconstruction, we discussed the possibility of a vascularized fibula graft versus a radius allograft, with their respective risks of infection, nonunion, hardware failure, and associated morbidities. The patient decided to proceed with a radius allograft.

A modified Henry approach was performed to resect the distal third of the diaphyseal radius and involved soft tissue. The distal metaphysis marked the distal extent of our resection. The tumor was left encased by the pronator quadratus and brachioradialis muscles, in order to prevent tumor cells from spilling into the surgical wound.

At the conclusion of the resection, attention was turned to reconstructing a functionally viable limb. The radius de-

fect, measuring 6.5 cm, was reconstructed using radius allograft to restore the original length. The graft was secured using an extra-long volar plating system (Hand Innovations, Miami, FL, USA). Cancellous iliac crest bone, obtained with clean instrumentation and gowning, was packed at the proximal and distal bone apposition sites.

The resected mass measured 6.2 cm x 5 cm and was surrounded by healthy tissue with grossly negative margins. Tumor transection revealed heterogeneous gray, white and red coloration with areas of hemorrhage. Tissue sections were fixed with formalin, embedded in paraffin, and stained with hematoxylin and eosin. Permanent section confirmed negative surgical margins. Tumor invasion into adjacent muscle was present. Histological analysis exhibited solid nests of tumor cells that lay on myxohyaline stroma with papillary structures and short strands. The tumor cells, in general, were uniform and round with some spindle shaped and some with endothelial differentiation demonstrated by intracytoplasmic lumina that could be seen as vacuoles (Figure 3).

At his 6 week post-operative visit, the patient complained of pain, numbness, and tingling bilaterally, with the right hand worse than the left. Review of outside electrical studies from the previous year revealed pre-existing carpal tunnel syndrome. An open carpal tunnel release was subsequently performed approximately 7 weeks after the initial operation.

The patient remained in a short arm cast for 12 weeks and then was allowed to utilize an orthoplast splint as needed for another 3 months. The splint was removed for hand therapy range of motion exercises only.

CT scan of the extremity demonstrated union at nine-months postoperatively of both the proximal and distal portions (Figure 4). At 16 months, physical examination, CT, and MRI did not demonstrate a recurrence.

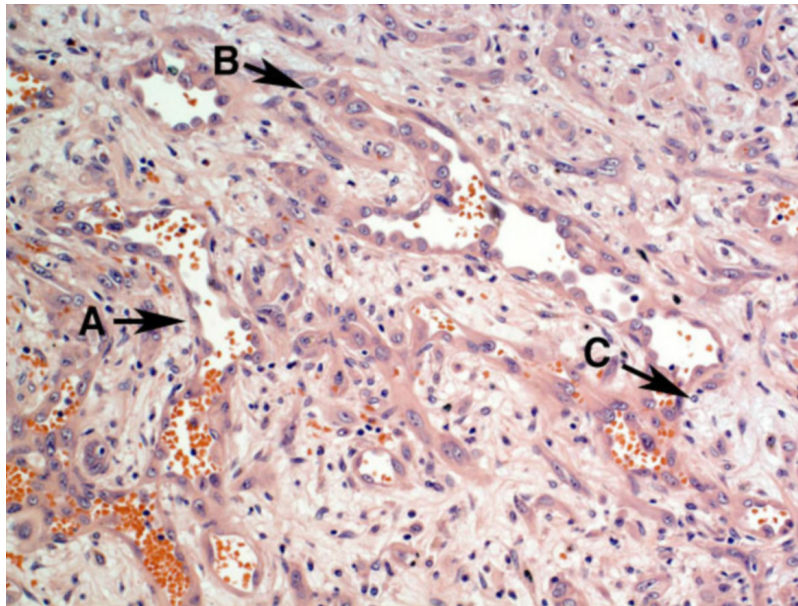


Figure 3. Hematoxylin and eosin stain of the high grade epithelioid hemangioendothelioma. Note is made of epithelioid neoplastic cells with prominent nuclei and nucleoli lining the vascular spaces, with eosinophilic and amphophilic cytoplasm. Focal myxoid or chondroid-like matrix is present. A: Vasoformative channels. B: Cytologic atypia, the nuclei are plump, hyperchromatic, variable in shape, and may bulge into the vascular lumina. C: Collagenized, chondroid appearing stroma.

## Discussion

Weiss and Enzinger [7] first coined the term “epithelioid hemangioendothelioma” to describe a subgroup of hemangioendotheliomas with a significant endothelial or histiocytic component. Other subtypes of hemangioendotheliomas include, kaposiform Dapska tumor (papillary intralymphatic angioendothelioma), spindle-cell, retiform (hobnail hemangioendothelioma) and composite. Epithelioid hemangioendotheliomas are vascular tumors composed of epithelioid-appearing endothelial cells organized into cords and nests in myxoid or hyaline stroma. These tumor cells rarely form well-defined vessels, but commonly contain small intracellular lumina that may contain erythrocytes. Mitotic activity is typically absent. However, in approximately 25% of cases, there are tumor zones with significant atypia, mitotic activity, cell spindling, or necrosis. The presence of these features suggests a more aggressive tumor that is sometimes referred to as a “malignant endothelial hemangioendothelioma.” Cytokeratin amino reaction is seen in approximately 25% of cases. The endothelial nature of the tumor is supported by the immunohistochemical links with CD31, CD34 and F8 immunopositive staining.

Vascular neoplasms of bone comprise less than 1% of bone neoplasms [8]. Classically, this tumor produces osteolytic reactions of lower extremity bone, with 60-80% involving the femur, tibia, fibula, or metatarsals [9, 10]. Tsuneyoshi et al [10] reported a case series of 14 patients with 29 epithelioid hemangioendothelioma lesions, with only 1 patient having radial involvement.

EH is a low-grade malignant tumor [1]. Weiss and Enzinger [1] have published their series of 46 patients after an average follow-up of 48 months. Thirteen percent developed a local recurrence and 31% developed metastatic disease in regional lymph nodes. The mortality rate was reported as 13%. Subsequent smaller series have cited the mortality rate of EH of bone to be 0% to 20% after an average of 3.5 to 4.3 years [4, 10]. Biologic behavior relating to histologic grade is controversial [5, 9]. Two studies have suggested that multicentric disease has a better prognosis than a solitary tumor [10-12]. However, a subsequent series has not supported this conclusion [4].

Wide resection is considered the preferred treatment for EH of bone [4, 10, 13-15]. However, a standardized approach has been difficult to establish because of its low incidence and variable malignant tendencies [13]. The role of radiotherapy also remains controversial. In the series by Kleer et al [4], 6 of the 10 patients who received radiotherapy died of metastatic EH and 4 of the 10 patients were



Figure 4. CT scan obtained 9 months postoperatively. The distal aspect of the graft is well incorporated. The proximal aspect demonstrates partial incorporation with ingrowth into the medullary canal and incomplete callus formation at the periphery. Heterotopic ossification is seen adjacent to the plate.

alive. Rosenthal et al [16] cited the efficacy of radiotherapy in one patient with multifocal EH of bone. The role of adjuvant chemotherapy in the treatment of EH of bone has not yet been determined [4, 14]. Our present case is in agreement with previous series that report wide local resection as the primary modality of treatment.

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