Well-Differentiated Extraskeletal Osteosarcoma

A Soft-Tissue Homologue of Parosteal Osteosarcoma

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- We describe a unique case of a low-grade extraskeletal osteosarcoma revealing both histologic and radiologic features reminiscent of parosteal osteosarcoma. The tumor, which had been present for 10 years, occurred in the left axilla of a 74-year-old black woman. To date, all the published cases of extraskeletal osteosarcoma have been high-grade neoplasms; to our knowledge, this is the first reported case of a low-grade extraskeletal osteosarcoma.

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Primary skeletal osteosarcoma typically occurs in the pediatric and adolescent populations. Histologically, it is characterized as a high-grade matrix-producing neoplasm that pursues a clinically aggressive course yielding a 5-year survival rate of 20%. In 1951, Geschickter and Copeland described three cases of a low-grade variant of osteosarcoma arising from the cortical surface (juxtacortical) under the name of parosteal osteoma of bone as a new entity. Subsequent studies have confirmed this so-called parosteal osteosarcoma as a distinct clinicopathologic entity. More recently, cases of low-grade intraosseous osteosarcoma, morphologically reminiscent of parosteal osteosarcoma, were reported by Umni et al. Extraskeletal osteosarcoma (EO), the soft-tissue counterpart of primary skeletal osteosarcoma, similarly comprises the features of a high-grade osteoid-forming sarcoma, with a poor long-term survival. However, in contrast to the two skeletal-based low-grade osteosarcoma variants, a comparable low-grade neoplasm arising in soft tissue, to the best of our knowledge, has not been described. The characteristic radiologic and histologic features of a well-differentiated ESO will be described.

REPORT OF A CASE

A 74-year-old black woman was admitted in February 1988 for the evaluation of a progressively enlarging mass in the left axilla. The mass had been present for more than 10 years; recently it underwent rapid enlargement and became uncomfortable. There was no history of local trauma, radiation, or intramuscular injection.

On physical examination, a large, bony, hard, nontender mass, measuring approximately 12 x 10 cm in diameter, was palpated in the left axilla. The tumor did not appear to be attached to skeletal structures. A second, large, soft, mobile mass was palpated in the area of the left posterior triceps muscle. No axillary lymphadenopathy was appreciated. Laboratory findings were unremarkable except for a mild elevation of the alkaline phosphatase level (105 IU/L; reference range, 25 to 88 IU/L).

Roentgenography of the left shoulder revealed a densely ossified mass measuring 14 x 11 cm in diameter. Four smaller but similarly dense tumors occurred lateral to the proximal humerus (Fig 1). The ossified lesion demonstrated no apparent relationship with the humerus; furthermore, there was no evidence of either cortical erosion or periosteal reaction. The dominant ossified mass revealed a lobulated outline with prominent central ossification, a profile reminiscent of parosteal osteosarcoma.

A transfemoral arteriogram disclosed buckling of the brachial artery over the large ossified mass, with the long thoracic artery and other collateral vessels supplying the medial and lateral borders of the lesion. No appreciable tumor vascularity was present. The computed tomographic scan indicated that the large ossified component of the lesion closely approximated, but was not attached to, the proximal humerus. Moreover,
Fig 1.—Roentgenogram of the left shoulder reveals a large, lobulated, densely ossified mass medial to the proximal humerus and four smaller but equally dense nodules within the vague soft-tissue density mass postero-lateral to the humerus. The smaller masses, especially, show prominent central ossification and less density at the periphery, which is a characteristic finding in parosteal osteosarcoma.

there was no periosteal reaction, cortical invasion, or intramedullary involvement. Magnetic resonance imaging studies of the left axilla showed a bulky 8 x 7 x 5-cm mass with heavy calcium deposition near the periosteal surface of the medial aspect of the left humeral metaphysis. A whole body scan revealed no local or distant bone involvement.

The patient underwent a wide excision of the left axillary mass. Operative findings confirmed the extraskeletal location of the tumor. It was relatively easily dissected and revealed no attachment to the brachial plexus, neurovascular bundles, or adjacent muscle.

The bilobed mass measured 15 x 13 x 5 cm in its entirety. One part was a bony-hard sphere measuring 12 cm in diameter; a second attached component consisted of yellow, lobulated adipose tissue that contained several ossified nodules ranging from 1.0 to 1.5 cm in diameter. On cross section, all the ossified masses disclosed solid, dense, gray-tan hyperostotic cut surfaces except for a "cavitation in the main mass (Fig 2).

On microscopic examination, the tumor was characterized by a complex interanastomosing pattern of osseous trabeculae. The bone, for the most part being woven type, as revealed with polarized light, formed either broad sheets or nodules. The bony trabeculae frequently were directly juxtaposed to the stroma; however, rarely they were lined by osteoblasts (Fig 3). The central portion of the tumor contained mature bone and lacked a proliferation of the fibroblastic component. The so-called zonal phenomenon, with its progressive peripheral osseous maturation, was not present; in contrast, the outermost bony tissue appeared less mature than the central component (Fig 4). The largest nodule was surrounded by thin condensed fibrous tissue; however, the smaller nodules within the fatty mass revealed an irregular border in multifocal areas (Fig 5).

The intertrabecular stroma consisted of elongated, plump, fibroblastlike spindle cells in parallel arrangement. These cells were relatively uniform and revealed mild nuclear atypia (Fig 6); mitotic figures were not identified. Less frequently and limited to the largest mass, the central stroma was densely hyalinized with obliteration of the cellular component. Also, in this same mass there was an eccentric cyst whose wall revealed old hemorrhage and fibrin deposition.

The attached mass of adipose tissue revealed features of an ordinary lipoma with sclerosis.

The postoperative course was uneventful as far as direct sequelae from the surgery. The most recent follow-up visit was 25 months after surgery, with no evidence of local recurrence or distant metastasis.

COMMENT

As a determinant of both prognosis and therapy, skeletal osteosarcoma is divided into the classic high-grade group and the more recently recognized...
Typically, the tumor is deep-seated and firmly attached to fascia; occasionally, it presents as a superficial movable mass. Preoperative duration ranges from 2 weeks to 25 years. Seventeen (19%) of 88 cases reported by Chung and Enzinger had a duration of more than 2 years. Extraskeletal osteosarcoma presents as a high-grade spindle cell sarcoma with malignant osteoid formation. Long-term survival is poor; patients eventually experience metastasis to lungs, lymph nodes, and bone. Overall median and 5-year survival rates were reported as 20 months and 25%, respectively. The majority of ESOs cannot be linked to any antecedent or causative factors. However, prior local irradiation was reported in 5.7% to 10% of cases; and trauma, in 13% of cases. Furthermore, ESO has been associated with the site of intramuscular injection or thorotrast injection. Finally, metaplastic bone, such as ectopic lamellar bone within thymic hamartoma, myositis ossificans, or heterotopic ossification of dermatomyositis can serve as a nidus for ESO, even though there are significant controversies.

The present case fulfills both the radiologic and the histologic criteria for ESO. The upper extremity is the second most common site. None of a variety of possible etiologic events, as detailed above, could be identified. However, the relationship of this ESO to a benign lipomatous tumor, well demonstrated on the whole mount sections, may offer one clue as to its histogenesis. Sarcomatous transformation within preexisting soft-tissue and osseous lipoma, although rare, does occur. Huvos observed the spontaneous transformation of benign into malignant soft-tissue tumors. Moreover, Ragsdale et al have described the evolution of a so-called intraosseous sclerosing lipomatous tumor into frank sarcoma. The lesion undergoes cystic transformation with the production of metaplastic bone that maintains a potential for malignant progression to osteosarcoma. Thus, the circumstantial evidence in this case, particularly in the absence of other identified causative or inciting mechanisms, favors origin of this low-grade ESO from lipoma.

This primary ESO reveals many of the radiologic features typically associated with parosteal osteosarcoma; moreover, the microscopic presentation is essentially indistinguishable from that of a parosteal osteosarcoma or a well-differentiated intraosseous osteosarcoma (Table 1). These similarities suggest that this tumor is a soft-tissue homologue of low-grade skeletal osteosarcoma. In the differential diagnosis, various benign and malignant soft-tissue osteogenic lesions were considered (Table 2).

Myositis ossificans (referred to as panniculitis ossificans when it occurs in the subcutaneous fat), a lesion most frequently affecting young adults, requires serious consideration in this case. In its developing state, myositis ossificans reveals a zonal phenomenon, characterized by a cellular fasciitish
core, an intermediate osteoid-forming region, and an outer layer of mature lamellar bone. In sharp contrast to this orderly centrifugal maturation, the well-differentiated ESO disclosed a converse pattern wherein the more central portion consisted of mature osseous trabeculae and the periphery contained immature (woven) osteoid (Table 1). Various pseudosarcomatous proliferative lesions of soft tissue with bone formation were considered. They include nodular fasciitis, proliferative fasciitis, and proliferative myositis. However, each of these lesions has a distinctive histologic pattern, especially the latter two, which contain characteristic basophilic ganglionlike cells, which are easily distinguished from well-differentiated ESO.

Ossification in dermatomyositis could be ruled out by the absence of characteristic clinical and histologic features including inflammatory background. Ossifying fibroosseous tumor of soft parts described recently by Enzinger et al was excluded by the absence of characteristic round to ovoid cells arranged in a cord or nestlike pattern. Heterotropic or metaphasic bone, calcifying synovial sarcoma, extraskeletal osteosarcoma, parosteal osteogenic sarcoma and sarcomata arising in abnormal bone: an analysis of 552 cases. J Bone Joint Surg Am. 1969;48:1-26.

References