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Imaging tumors of the patella

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ABSTRACT

Background: Patellar tumors are rare; only a few series have been described in the literature and radiographic diagnosis can be challenging. We reviewed all patellar tumors at one institution and reviewed the literature.
Materials and methods: In an evaluation of the database at one institution from 1916 to 2009, 23,000 bone tumors were found. Of these, 41 involved the patella. All had imaging studies and microscopic diagnostic confirmation. All medical records, imaging studies, and pathology were reviewed.
Results: There were 15 females and 26 males, ranging from 8 to 68 years old (average 30). There were 30 benign tumors; eight giant cell tumors, eight chondroblastomas, seven osteoid osteomas, two aneurysmal bone cysts, two ganglions, one each of chondroma, exostosis, and hemangioma. There were 11 malignant tumors: five hemangioendotheliomas, three metastases, one lymphoma, one plasmacytoma, and one angiosarcoma.
Conclusion: Patellar tumors are rare and usually benign. As the patella is an apophysis, the most frequent lesions are giant cell tumor in the adult and chondroblastoma in children. Osteoid osteomas were frequent in our series and easily diagnosed. Metastases are the most frequent malignant diagnoses in the literature; in our series malignant vascular tumors were more common. These lesions are often easily analyzed on radiographs. CT and MR define better the cortex, soft tissue extension, and fluid levels. This study presents the imaging patterns of the more common patellar tumors in order to help the radiologist when confronted with a lesion in this location.

1. Introduction

Tumors of the patella are very rare and often present with knee pain and/or swelling, or may be found as incidental lesions. Only a handful of studies report a series of patella tumors [1–12]; most are case reports [8]. While most authors report a high percentage of tumors in this location to be benign (the most frequent diagnoses being giant cell tumor, chondroblastoma, and aneurysmal bone cyst), the differential diagnosis for a solitary lesion of the patella is broad and contains several sinister entities (most frequently metastases).

Patellar tumors are usually not studied with the full complement of imaging modalities that are otherwise used for staging of lesions and for preoperative planning. Radiographic diagnosis of patellar tumors can be challenging, however, radiographs alone are usually sufficient to make the correct diagnosis. When radiographic appearance leaves doubt as to the diagnosis, confirmation by biopsy is always necessary to avoid overtreatment of benign tumors or inadequate surgery for malignant lesions.

We present our single-institution series of patellar tumors. Pathologic diagnoses, age, gender, relative incidence, and our imaging findings are presented in conjunction with those imaging findings described in the literature.

2. Materials and methods

From 1916 to 2009, 23,000 bone tumors were evaluated at our institution; only 41 were located in the patella. All cases had imaging studies and microscopic confirmation of the diagnosis. Medical records were reviewed for all cases. For 10 patients only radiographs were available. One patient had radiographs and a computed tomography (CT) scan, another had radiographs, bone scans, and angiography. In 28 cases, radiographs, CT, and bone scans were available for evaluation. MRI was used in only 7 cases. Two musculoskeletal radiologists each reviewed all cases. Imaging characteristics evaluated included: appearance of lesion (lytic, blastic, mixed, matrix production), location in the patella, portion of patella

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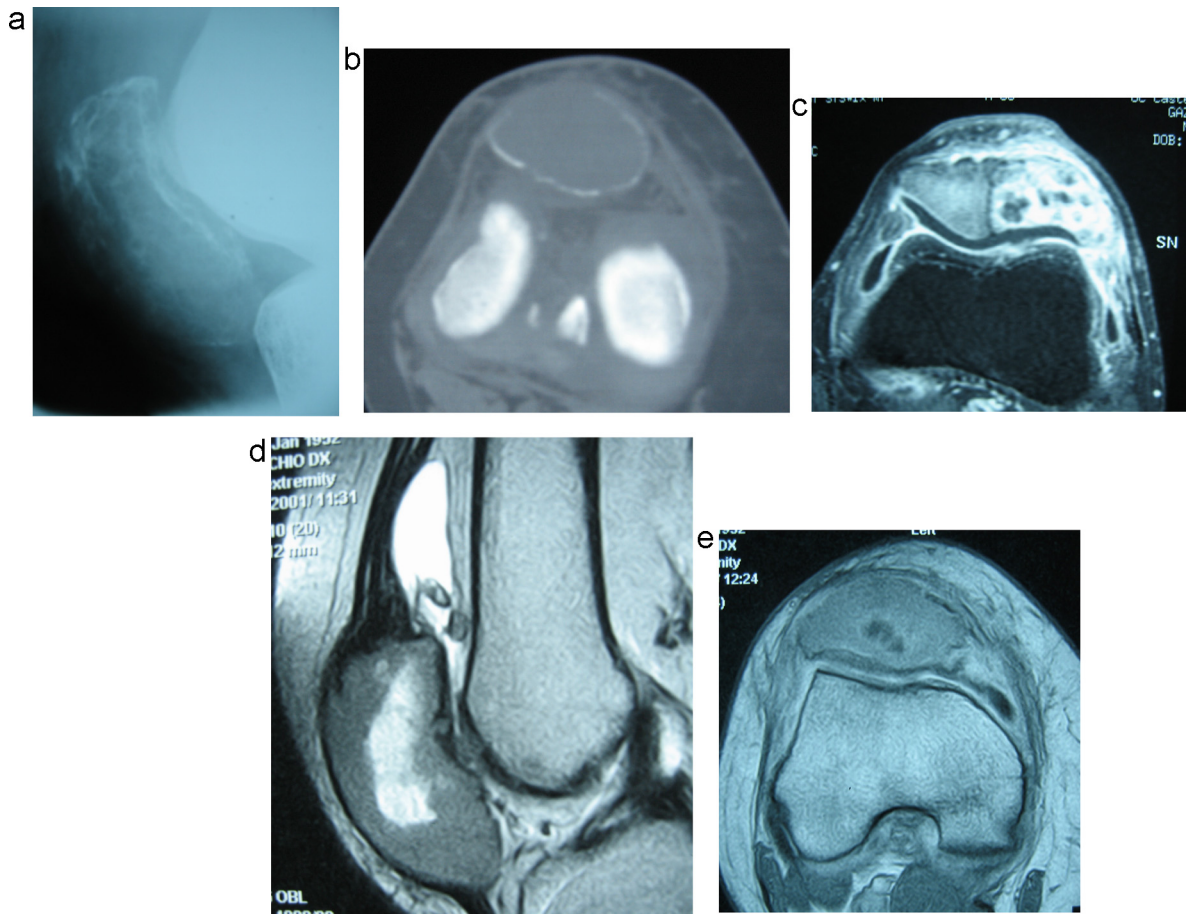

Fig. 1. Giant cell tumors of the patella. a: Involvement of the entire patella. Margins are often ill-defined and pathologic fracture frequently occurs. b: CT demonstrates the cortical expansion and destruction. c–e: MRI reveals intra-articular fluid as well as any ligament, tendon, and/or joint involvement.

affected, nature of cortex, presence of a periosteal shell or reaction, bone expansion, soft tissue involvement, septae, and/or pathologic fracture, and whether or not there was joint involvement. The literature was reviewed from 1900 to 2009.

3. Results

Twenty-six patients were male, 15 female, with an average age at presentation of 30 years (range, 8–68). There were 30 benign (73%) and 11 malignant tumors (27%) with a prevalence for males in both groups (60% and 72%, respectively). Patients with benign tumors were younger than patients with malignant tumors (average age 26 years *versus* 39 years, respectively).

Of the benign lesions, there were eight giant cell tumors (19.5% of all patellar tumors in our series), eight chondroblastomas, seven osteoid osteomas, two aneuyrsmal bone cysts, two intraosseous ganglion cysts, and one chondroma, osteochondroma, and hemangioma each. Of the malignant tumors, there were six vascular tumors (14.6%), two hematologic tumors, and three metastases.

3.1. Radiographic findings of specific tumor types

3.1.1. Benign tumors

3.1.1.1. Giant cell tumors. We found 8 cases of giant cell tumor (GCT) in our series of patellar tumors (19.5%, Fig. 1). Five patients (62.5%) were female, three male, with an average age of 32 years (range 17–54). In four cases, tumor involved the entire patella, in two patients two-thirds was involved, and in two patients half was affected by tumor. Margins of these lytic lesions were ill-defined in five patients, and sharp in the other three. The cortex was expanded in five patients, nearly completely destroyed in two, and significantly thinned in one. Reactive sclerotic rims were absent in all cases. Mineralization was not present in any of the lesions. Septations were observed in four cases. For patients where CT or MRI was used, fluid levels were not observed. Two patients (25%) had a pathologic fracture; in only one case there was there joint contamination.

3.1.1.2. Chondroblastoma. Eight cases were observed in the patella (19.5%, Fig. 2). Six patients (75%) were male, two female (25%), with an average age of 19 years (range 8–27). All patients had a geographic lesion of the patella, encompassing more than half of the bone in six cases. The margins of the lesion were well-defined in all patients; the cortex was thinned in seven and unaffected in one. A periosteal shell was seen in one case and a sclerotic rim in four others. No periosteal reactions or septations were seen in our series. In four cases small, diffuse calcifications were observed, but no ossification. Fluid levels were observed in one case. Pathologic fracture was observed in six cases. None of the cases had joint involvement.

3.1.1.3. Osteoid osteoma. Seven cases occurred in the patella (17%, Fig. 3). Four patients (57%) were female, 3 (43%) male, with an average age of 19 years (range 11–34). The nidus was evident on imaging studies for all patients and was located in different sites: one central, two lateral, two medial, one anterior, one posterior. Four were intra-cortical, one sub-periosteal, and two in cancellous bone. A diffuse, ill-defined sclerotic reaction around the nidus was observed in four cases. An ossified nucleus of varying extent was observed