Giant-Cell Tumors of the Patella

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Abstract

This study describes the clinical, radiographic, and histopathologic features, and discusses the management options of 11 cases of benign giant-cell tumors of the patella seen over 20 years. Fine needle aspiration cytology was a useful preoperative diagnostic tool. Patellectomy and reconstruction of the extensor apparatus is the favored treatment option with curettage and bone grafting restricted to selected localized lesions.

The knee joint is the most common site for giant-cell tumors of bone. However, primary neoplasms arising in the patella are a rare entity.1,2 A review of patellar neoplasms revealed 16 cases of giant-cell tumors of the patella among 29 primary patellar neoplasms over the past 20 years. Other neoplasms were chondroblastoma (5 cases), hemangioma (1 case), and bone cysts (4 cases). In three patients, the histological diagnosis was not available.

This article describes the clinical presentation, radiographic features, histopathologic findings, and treatment options for giant-cell tumors of the patella.

Materials and Methods

Clinical records, histopathology slides, and radiographs of all cases of giant-cell tumor of the patella admitted over 20 years (1978-1998) were retrospectively reviewed. Of 16 patients, 4 were excluded because of inadequate follow-up. The record of 1 patient was incomplete. Data of the remaining 11 patients (8 males and 3 females) are summarized in the Table.

Average patient age was 26 years (range: 15-34 years). Common presenting features were mild to moderate enlargement of the patella (9 patients), pain (8 patients), and restricted knee joint motion with difficulty squatting and walking (6 patients). Average time between symptoms onset and initial presentation was 4.5 months, usually when pain and swelling interfered with daily activities.

The adjoining soft tissue was not seen in any patient, and the skin and subcutaneous tissues were freely mobile over the patella. No patient had undergone any surgical intervention prior to presentation at our institution.

Preoperative diagnostic evaluation was based on radiographs of the knee and fine needle aspiration cytology of the lesion. Patients were treated with curettage and bone grafting or by total patellectomy and reconstruction of the extensor apparatus. An above-knee cylinder cast in extension, which supervised knee mobilization exercises, was applied to all patients for 3-4 weeks postoperatively. Average postoperative follow-up was 63 months (range: 14-94 months). Minimum follow-up for inclusion was 12 months.

One patient (patient 10) had a pathologic patella fracture sustained after slipping. The lytic lesion in the initial radiograph was overlooked at the primary health center and a plaster cast was applied (Figure 1).

Two months after cast removal, the patient presented with a grossly enlarged patella and inability to actively flex or extend the knee joint. Passive movements of the knee joint were painful, and the patient was unable to walk. A hemorrhagic effusion was present. The surrounding soft tissues were normal and nonadherent to the patella although side-to-side movements of the patella were absent. Despite restricted knee joint motion, the vertical movement of the patella in the trochlear groove was discernible, albeit diminished.

Radiographs revealed expansion of the patella in all dimensions with loss of normal contour (Figure 2). Destruction of the normal trabecular pattern of bone
and loss of articular surface definition was observed. On fine needle aspiration cytology, sheets of ovoid stromal cells and multinucleate giant cells were detected.

Total patellectomy (Figure 3) and reconstruction of the extensor apparatus by strips of fascia lata were performed. No evidence of malignancy was detected on histopathologic examination. There were no malignant cells in the knee joint fluid. However, 14 months postoperatively, the patient developed pulmonary metastasis and subsequently died of pulmonary failure.

**RESULTS**

In six patients presenting within 4 months of symptom onset, the lesion was confined to a part of the patella. The maximum diameter of the lesion was between 1.5 and 4 cm with an intact normal cortical periphery. An incomplete sclerotic margin was present around the lesion. The remaining five patients had a lesion essentially replacing the entire patella with varying degrees of bony expansion and loss of congruity of the articular cartilage. No evidence of coexistent soft-tissue mass was detected in any patient.

Computed tomography (CT) and magnetic resonance imaging (MRI) were not performed due to the superficial site and benign appearance of the neoplasms on preoperative cytological examination. Postoperative benign pulmonary metastases were detected in one patient after curettage and autologous bone grafting. The patient refused further surgery. No further follow-up was available.

Fine needle aspiration cytology of the patella in the preoperative diagnosis of patellar swelling is routinely used. In addition, the synovial fluid also is examined through a separate puncture site to detect intra-articular spread as CT and MRI were not used. The aspiration smears contained cohesive clusters of stromal cells and multinucleated osteoclastic giant cells. The nuclear features of both types of cells were identical. Hemosiderin laden cells, endothelial cells, or macrophages were not seen in any patient.

All resected patellae underwent a thorough histopathologic examination to establish the diagnosis and detect any evidence of malignancy. Paraffin section examination confirmed the cytological diagnosis of giant-cell tumor of bone (Figure 4). Alkaline phosphatase activity was absent on histochemical staining of the smears.

**DISCUSSION**

Benign giant-cell tumors are the most common patellar neoplasms. Giant-cell tumors of the patella commonly present with intermittent pain and expansion of the patella. Restriction of knee flexion is due to pain and mechanical restraint of the extensor apparatus. Initial symptoms may be nonspecific and falsely correlated to an unassociated trivial trauma. One case of pathologic fracture occurred in a benign giant-cell tumor of the patella. Failure to diagnose the neoplasm in the initial stage led to further expansion and refracture in this patient.

Fine needle aspiration cytology of the neoplasm and examination of synovial fluid for malignant cells has a high predictive value and was a reliable tool for the preoperative diagnosis. This obviates the need for a preoperative incisional biopsy and reduces the time and cost of treatment. The absence of hemosiderin laden cells, endothelial cells, and macrophages distinguishes these smears from aneurysmal bone cysts and brown tumors.

Postoperative histologic examination of the resected specimen showed ovoid to rounded stromal cells and a fair number of interspersed large multinucleated osteoclastic giant cells. No case had large vascular spaces lined by
epithelium as in aneurysmal bone cyst; the stroma was not fibroplastic as in unicameral bone cyst and brown tumors. Further, there was no atypia, pleomorphism, or neo-osteogenesis in smears on paraffin section. No osteoid material was present. Alkaline phosphatase activity was absent on histochemical smear staining.

Incisional biopsy may be useful in suspected cases of sarcoma of the patella to establish a tissue diagnosis and to serve as a baseline for subsequent histopathologic analysis after chemotherapy and surgery. Ferguson et al. recommend incisional biopsy for tissue diagnosis in cases of patellar malignancies. Kransdorf et al. did not perform CT or MRI in their series of 42 primary tumors of the patella. They performed radionuclide scanning in 4 patients. This is a nonspecific test and is expected to be positive in the majority of patellar neoplasms and traumatic lesions. The specialized imaging studies are indicated for planning management of patellar sarcomas. For histologically or cytologically proven benign giant-cell tumor of the patella, anteroposterior, lateral, and sunrise radiographs of the patella will help decide between patellectomy and curettage.

Although the limited number of cases in the present series precludes any definite recommendation, curettage may be indicated in superficial localized lesions with an intact wall of at least 5 mm all around with minimal expansion of the patella and distortion of the articular surface. Mercuri et al. recommend curettage for stage I and II benign lesions. During curettage, caution should be exercised to prevent contamination of the joint. Curettage, however, may increase the risk of recurrence and subsequent development of pulmonary metastasis due to release of tumor cells in the bloodstream. The development of pulmonary metastasis has been reported in 1%-3% of benign giant-cell tumors of the patella. In the present series, one patient who developed metastasis had a pathologic fracture and another had undergone curettage and bone grafting. Both circumstances could have been responsible for the dissemination of the tumor cells.

Patellectomy is the preferred treatment for aggressive benign and stage IA malignant lesions. Hydrogen peroxide was used for sterilizing the knee joint at patellectomy. Reconstruction of the extensor apparatus was required in five patients and free fascia lata strip grafts were used. Of the five patients undergoing this procedure, seven had an extensor lag of 10°-20°. Average range of active flexion was 80°.

Extra-articular resection is recommended for benign metastases with pathological fracture. One case of pathological fracture in a benign giant-cell tumor was treated with patellectomy and the patient developed benign pulmonary metastasis. Absence of malignancy on histopathologic examination and cytology of synovial fluid influenced preservation of knee joint mobility.

The prognosis of benign patellar giant-cell tumors in terms of preservation of the patella and the functional outcome is dependent on their early diagnosis. A high index of suspicion is essential to detect early neoplasms.

REFERENCES