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Pathologic fracture of a giant cell tumour of the patella

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Abstract

This report describes a pathologic fracture of the patella secondary to destruction by a giant cell tumour. Diagnosis was made after non-union of a patella fracture, with osteolysis and soft tissue invasion. Delayed union of any fracture should raise the possibility of an underlying pathologic process.

Keywords

Giant cell tumour; patella; pathologic fracture; orthopaedic surgery.

Case history

A 22-year-old woman, who was 13 weeks pregnant, presented with right knee pain and swelling. She had slipped in the bathroom a week earlier, falling backwards with her right knee extended. The patient was unable to bear weight after the fall and was able to perform a straight leg raise. There was bruising to the anterior knee and the patella remained tender to palpation. There was no soft tissue mass present. The initial radiographs revealed a comminuted fracture of the inferior pole of the patella (Fig. 1a). Blood (150 ml) was aspirated from the knee in the emergency department.

The patient was prescribed oral analgesia and advised to remain non-weight bearing with crutches in an extension splint for 6–8 weeks. She was reviewed in the outpatient department with radiographs taken at 1 month, 2 months and 3 months after the fall. There were no features of radiological union over the 3-month period, however the patient had an active range of motion of 0–130° and mobilized without gait aids or an extension splint. Her patella was non-tender. She had returned to work without any restrictions.

Seven months after her initial injury, and now 1 month post partum, the patient presented to the emergency department again with increasing pain and boggy swelling at her right knee. She described daily episodes of knee instability. On examination she demonstrated an antalgic gait and her knee was grossly swollen with engorged subcutaneous blood vessels around the anterior knee (Fig. 2). The range of motion of the knee was now restricted by pain and she was unable to perform a straight leg raise.

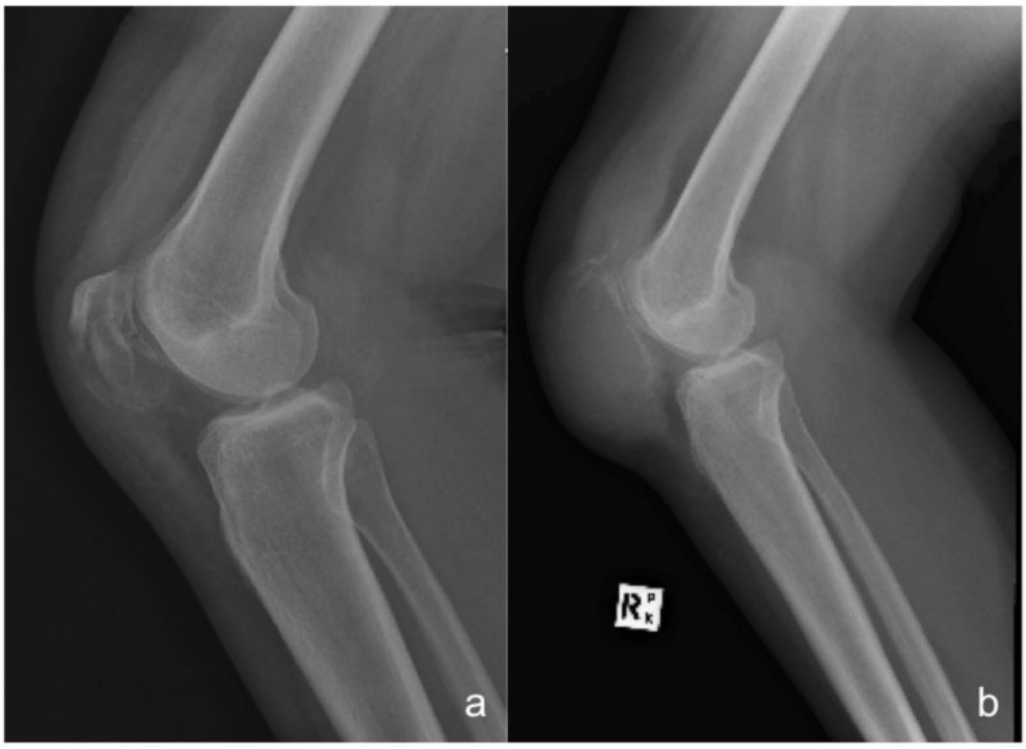

Fig. 1. Lateral radiographs of the right knee obtained at: (a) initial presentation; and (b) 7 months after injury.

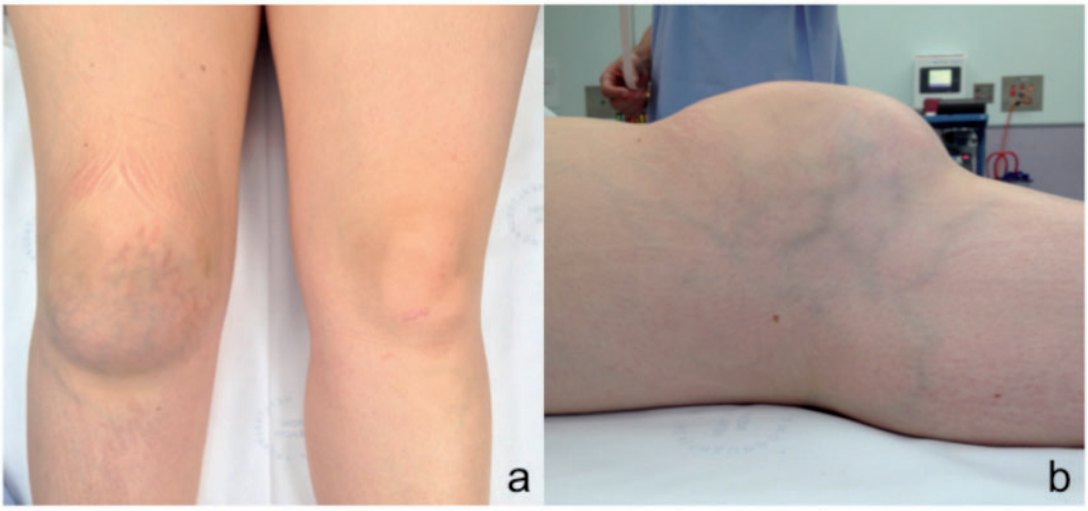

Fig. 2. (a) Anterior and (b) lateral appearance of the knees 7 months after injury. The knee is swollen with an effusion. Distended subcutaneous blood vessels are observed in the infrapatellar region.

Diagnosis

Plain radiographs revealed an expansile, lytic mass occupying the patella, measuring 4 cm by 6 cm (Fig. 1b). A bone scan revealed increased uptake of tracer at the patella (Fig. 3), and magnetic resonance imaging showed an expansile soft tissue mass replacing the patella and invading adjacent soft tissues. Multiple septations within the tumour mass were evident. The lesion was enhanced with contrast, dark on T1- and bright on T2-weighted images (Fig. 4). There were no abnormalities seen on computed tomography of the chest, abdomen and pelvis.

Open biopsy of the patella was performed through a midline incision. The tissue was tan coloured and fleshy in appearance. Histopathology demonstrated large numbers of

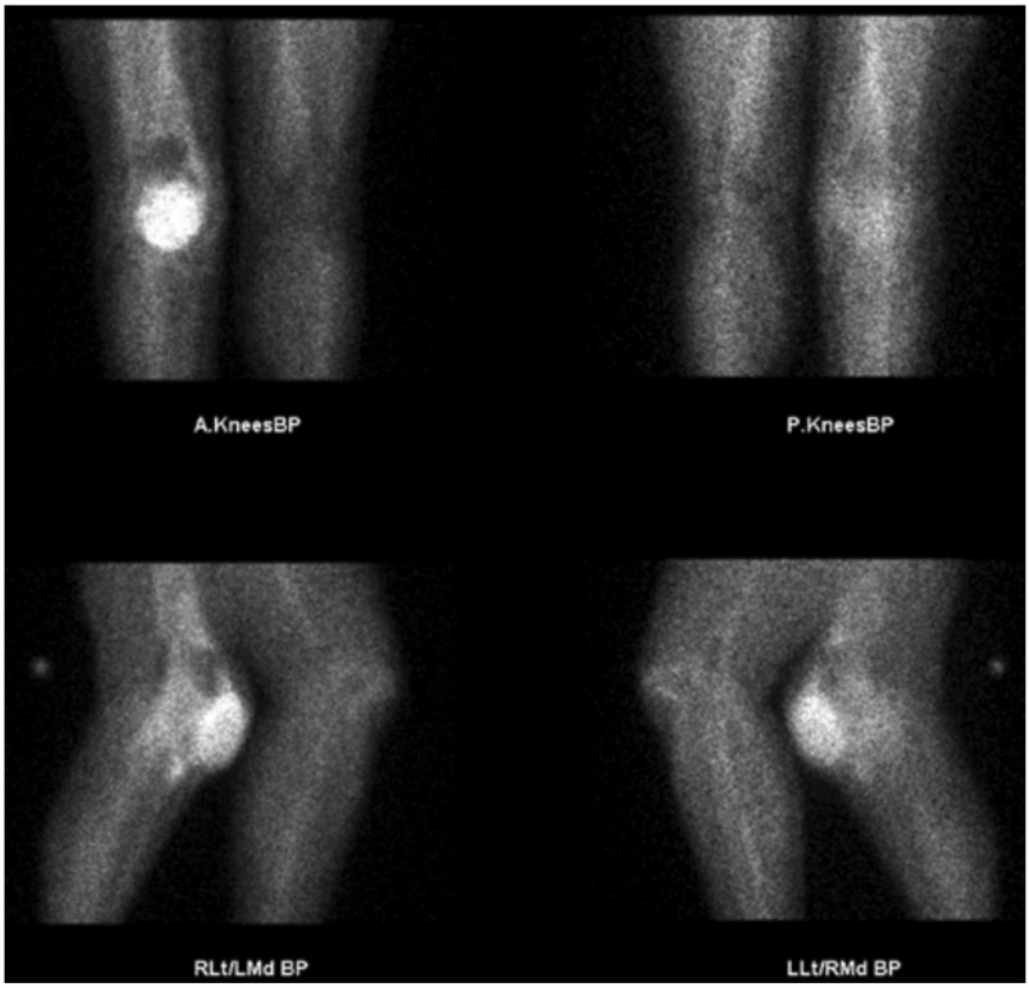

Fig. 3. Bone scan showing increased tracer uptake at the right patella.

osteoclast-type multinucleated giant cells in a background of mononuclear stromal cells arranged in syncytial sheets. A number of multinucleated giant cells were observed to be merging. No significant cellular atypia was seen. These distinctive features are consistent with giant cell tumour (GCT) of bone. En-bloc resection of the tumour was performed with reconstruction of the extensor mechanism by quadriceps turndown. A gastrocnemius flap was used to fill the defect. Clear margins of resection were obtained.

Clinical evidence and unusual features

The patella is an uncommon location for a GCT to occur. GCT most commonly occurs in the epiphysis or apophysis of a bone. Pathologic fracture is also an uncommon presenting complaint for GCT. Radiographs obtained at the primary presentation were not characteristic of a GCT, however features suggestive of delayed union should alert the practicing radiologist and orthopaedic surgeon of the possibility of pathologic fracture. Early definitive diagnosis of a destructive lesion such as a GCT allows for less aggressive treatment. For this reason, it is essential that patients with atypical fractures be closely followed up until union.

GCT is a tumour of mesenchymal origin that appears in mature bone, most commonly at the distal femur, proximal tibia, proximal humerus or distal radius. GCT may be considered a benign although locally aggressive tumour[1]. The appearance of a cystic lesion extending up to the subchondral plate in mature long bones is characteristic of GCT[2]. The patella is an exceedingly rare location for primary neoplasms. The Bone and Soft Tissue Tumour Committee of the Japanese Orthopaedic Association reported that of 27,403 primary bone tumours treated between 1972 and 2003, only 75 of involved the patella; 2126 cases of GCT were recorded, but only

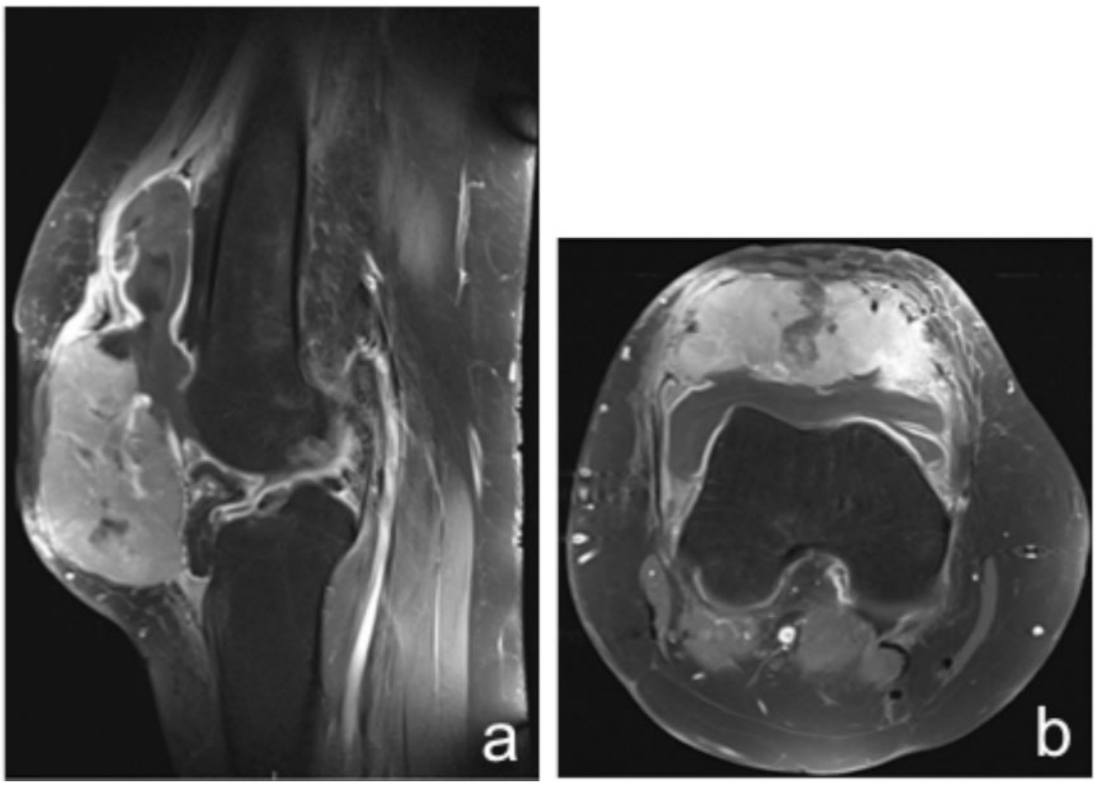

Fig. 4. T2-weighted (a) sagittal and (b) axial magnetic resonance images of the knee demonstrating an expansile lesion replacing the patella and invading the adjacent soft tissues.

22 cases of GCT of the patella (1.47%)[3]. The Mayo Clinic has presented a series of 671 GCTs of bone, only 1 of which was located in the patella[4].

Intralesional curettage and bone grafting is the mainstay of treatment for most GCTs, however the recurrence rate may be as high as 45% without local adjuvant therapy[1,5]. The use of adjuvants such as phenol, hydrogen peroxide, liquid nitrogen and bone cement reduces the recurrence rate to 17%[1]. High-speed burr extended curettage is associated with a 12% recurrence rate[6]; cryosurgery reduces the recurrence rate to <8%, however it is associated with pathologic fracture and vascular injury[7]. Wide surgical resection is the treatment of choice for aggressive and recurrent lesions, however it is associated with higher rates of complications as a result of the complex reconstructions that are often required[1]. Medical management using diphosphonates with an anti-osteoclastic effect reduce the recurrence rate to 4.2%[8]. Denosumab is a human monoclonal antibody to RANKL (receptor activator of nuclear factor-κB ligand), expressed by osteoclastic giant cells, and is a recent development in the treatment of GCT. Phase II studies have demonstrated the efficacy of denosumab in disease and symptom control, without adverse side effects[1,9].

Teaching points

- Delayed union of a fracture should raise the possibility of an underlying pathologic process.
- Diagnosis of GCT relies on multimodal imaging and tissue biopsy.
- Most common sites for GCT are the distal femur, proximal tibia, proximal humerus or distal radius. Patella GCT is uncommon, although may be locally aggressive.

References

1. Raskin KA, Schwab JH, Mankin HJ, Springfield DS, Hornicek FJ. Giant cell tumor of bone. J Am Acad Orthop Surg 2013; 21: 118–126. PMid:23378375.
2. Solomon L, Warwick D, Nayagam S. Apley's system of orthopaedics and fracturesxi. 8th ed. London: Arnold; 2001. xi, 781 p.

3. Yoshida Y, Kojima T, Taniguchi M, Osaka S, Tokuhashi Y. Giant cell tumor of the patella. Acta Med Okayama 2012; 66: 73–76. PMid:22358142.
4. Unni KK, Dahlin DC. Dahlin's bone tumors: general aspects and data on 11,087 casesxi. 5th ed. Philadelphia: Lippincott-Raven; 1996. xi, 463 p.
5. Miller G, Bettelli G, Fabbri N, Capanna R. Curettage of giant cell tumor of bone. Introduction–material and methods. Chir Organi Mov 1990; 75(1 Suppl): 203. PMid:2249532.
6. Blackley HR, Wunder JS, Davis AM, White LM, Kandel R, Bell RS. Treatment of giant-cell tumors of long bones with curettage and bone-grafting. J Bone Joint Surg Am 1999; 81: 811–820. PMid:10391546.
7. Malawer MM, Bickels J, Meller I, Buch RG, Henshaw RM, Kollender Y. Cryosurgery in the treatment of giant cell tumor. A long-term followup study. Clin Orthop Related Res 1999; (359): 176–188.
8. Tse LF, Wong KC, Kumta SM, Huang L, Chow TC, Griffith JF. Bisphosphonates reduce local recurrence in extremity giant cell tumor of bone: a case-control study. Bone 2008; 42: 68–73. PMid:17962092.
9. Lewin J, Thomas D. Denosumab: a new treatment option for giant cell tumor of bone. Drugs Today 2013; 49: 693–700. PMid:24308016.