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Case Report

Patella Fracture with Significant Bone Defect Due to Tophaceous Gout

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Abstract

Introduction: Pathologic fractures are a rare complication of tophaceous gout. Dual-Energy CT scans (DECT) can aid in the diagnosis of tophaceous gout, accompanied by patient history.

Case presentation: A 45-year-old male with history of tophaceous gout fell down resulting in a closed transverse patella fracture with complete disruption of the extensor mechanism. DECT scan confirmed the diagnosis of gouty tophus as well as provided further detail about the patient's patellar bone stock. The gouty tophus had infiltrated the entirety of the patella tendon with bony defect in the center of the patella. After OREF, The bony gap was packed with cancellous allograft. Pathology of the excised patellar tissue was consistent with gouty tophus. Follow up at 6 months showed satisfactory.

Discussion: Clinically significant patellar erosions are rare; however, it is likely under-reported. Although involvement of the patella and patellar tendon has been previously discussed in the literature, few report associated patellar fracture. We describe a case of patellar fracture through tophaceous gout after relative minor trauma.

Gout erosions may closely mimic other tumor and tumor-like lesions of the patella. DECT is 90% sensitive and 83% specific in the diagnosis of gout, although its diagnostic accuracy is limited in patients with advanced knee arthritis or recent onset gout, and may also be utilized to assess bone stock. Magnetic resonance imaging may also be helpful.

The patient reported was successfully treated with open reduction and internal fixation with two screws as well as bone grafting.

Keywords: Patella fracture; Bone defect; Tophaceous gout; Open reduction internal fixation; Bone graft; Case report

Introduction

In the following case, we describe a low-energy pathologic patellar fracture in a patient with chronic and poorly controlled gout with evidence of bony erosion and tophi of the bilateral patella.

Gout affects over 8 million people in the United States [1] and is characterized by chronic hyperuricemia leading to an inflammatory response triggered by Monosodium Urate (MSU) crystal deposition within soft tissues, bones, and joints. Men are affected more frequently and typically earlier in life than women. Chronic and poorly controlled gout can lead to the formation of granulomatous-like tophi, which house large quantities of MSU crystals, inflammatory cells, and pro-inflammatory cytokines [1,2].

Tophaceous gout indicates advanced disease and is associated with increased morbidity secondary to destruction of surrounding tissue architecture. Common sites of tophus formation include the olecranon bursa, base of the thumb, and the Achilles tendon [2]. Tophi deposition has also been reported in unusual locations such as the spinal cord, sesamoid bones of the foot, and patella [3]. Patellar involvement, while rare, is well-documented in the literature [4-21]. Tophus formation in these cases was almost invariably found within the superolateral aspect of both normal and bipartite patellae. The typical clinical presentation was a painful and swollen knee in an older male with a long history of poorly controlled gout.

Pathologic fractures are a rare complication of tophaceous gout and likely result from local erosion with subsequent bony architecture compromise. Fractures through tophus sites within the talus [22], metatarsals [16], malleoli [16], femoral neck [16], hip [23], phalanx [16], and odontoid [24] have all been reported in the literature. While rare overall, patellar fractures make up the relative majority of gouty pathologic fractures, with eight reported cases to date [4,5,8,10,11,16,17,21]. The mechanisms of fracture were mostly low-energy falls or atraumatic in nature. The fractures in this limited cohort were generally treated surgically with open reduction and internal fixation.

An important consideration in the diagnosis and management of pathologic patellar fractures is the close resemblance of the osteolytic lesions produced by tophi and those of potentially devastating neoplasms. Conventional imaging techniques such as radiographs, computed-tomography, and MRI can fail to differentiate a gouty tophus from an aggressive tumor [13]. Dual-Energy CT scans (DECT) can detect the presence of MSU crystals within a mass of interest. DECT can therefore aid in the diagnosis of tophaceous gout, potentially avoiding the need for biopsy [25]. A comprehensive patient history with emphasis on previous gout attacks or associated conditions is also vital to proper diagnosis. Needle aspiration and

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serum uric acid levels can provide additional information, but are not mandatory.

Case Presentation

A 45 year-old male with long-standing history of tophaceous gout fell down four stairs with direct impact to the left patella. The fall resulted in a closed transverse patella fracture. On examination, the patient had multiple gouty tophi (Figure 1). The injury resulted in complete disruption of the extensor mechanism. He was otherwise neurovascularly intact. Plain radiographs revealed gouty erosions about the patella fracture (Figure 2). DECT scan confirmed the diagnosis of gouty tophus as well as provided further detail about the patient's patellar bone stock, revealing a large central erosion however adequate bone about the medial and lateral aspects of the patella (Figure 3). The patient's serum uric acid level was elevated at 7.2 mg/dL. The patient's laboratory workup was otherwise unremarkable. The decision was made to take the patient to the operative suite for open reduction and internal fracture fixation.

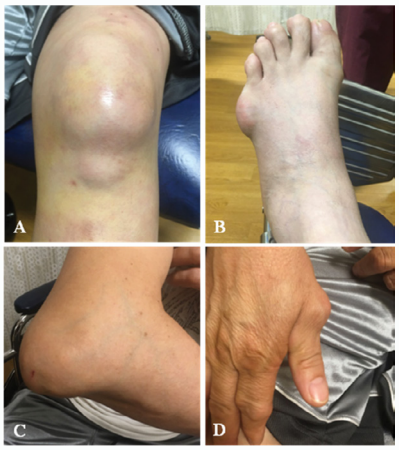

Figure 1: Patient's multiple gout tophi about the left patella (A), left foot (B), right elbow (C), and left thumb (D), upon presentation to the emergency department.

Figure 2: Radiographs at initial presentation demonstrating a displaced transverse left patella fracture on both AP (A) and lateral (B) views. (C) Bony lytic erosions of bilateral patella are visualized on a merchant view.

The patient was positioned supine on a radiolucent table. A 12 cm midline longitudinal incision was made over the palpable defect in the fractured patella. Superficial soft tissues were retracted which exposed a chalky, caseous substance enveloping the fractured patella and the patellar tendon (Figure 4). The material had a white/light grey appearance and was easily moldable with gentle pressure consistent with gouty tophus. Tophus-like material was excised to better identify anatomical structures and sent for formal pathology evaluation. The gouty tophus had infiltrated the entirety of the patella tendon as it had an abnormal physical appearance and texture. Soft tissues were sharply debrided from the fracture site and the superior and inferior patellar fragments were reduced. Provisional fixation was obtained with 1.3 mm K-wires and pointed AO reduction clamps (Figure 5). After an appropriate anatomic reduction was confirmed both visually and fluoroscopically, it was determined that there was a 2.5 cm × 4 cm bony defect in the center of the patella with preservation of the articular surface (Figure 6). It appeared that the tophus had directly eroded the middle third of the patella, leaving corridors of good bone stock medially and laterally. It was in these bony corridors that two 4.0 mm partially threaded screws were placed which obtained good compression of the fracture. #2 Fiber Wire was passed through the medial cannulated screw from superior to inferior and the lateral cannulated screw from inferior to superior. It was then passed circumferentially around the reduced patella and secured superiorly. The bony gap was packed with cancellous allograft and the wound was closed in layers, securing the bone graft in place (Figure 7). Final radiography revealed appropriately positioned hardware with restoration of the anatomic alignment of the patella (Figure 8).

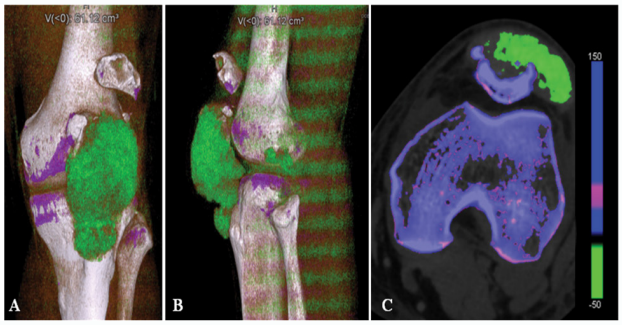

Figure 3: Dual-energy CT scan detecting monosodium urate deposits (green) in the left knee. (A, B) 3D reconstruction showing tophaceous gout enveloping the inferior component of the fractured patella. (C) Axial cut through the inferior component showing lytic erosion of tophus centrally within the patellar bone.

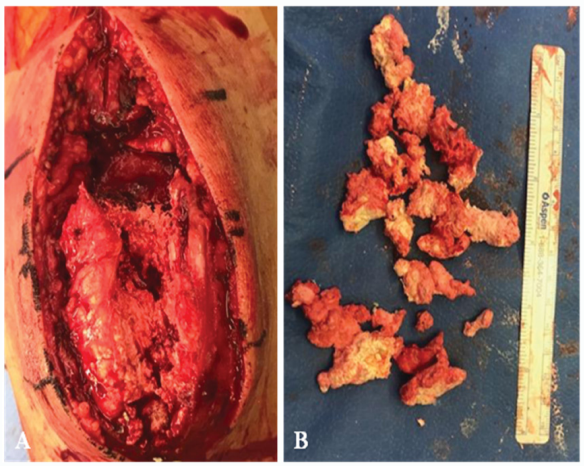

Figure 4: (A) Intraoperative view of patella fracture site showing large tophaceous mass in-situ. (B) Excised mass revealing white, chalky, malleable material.

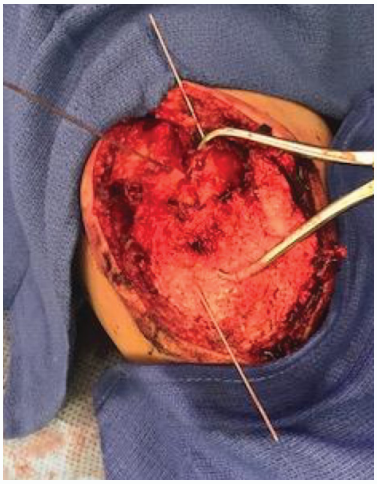

Figure 5: Provisional fixation of patellar fragments with 1.3 mm K-wires and pointed AO reduction clamps.

Figure 6: Bony defect measuring 2.5 cm × 4 cm at the center of the patella.

Figure 7: Cancellous allograft filling the central defect of the patella.

Post-operatively, the patient was placed in a hinged knee brace locked in extension and instructed to be non-weight bearing. The patient discharged uneventfully on post-operative day 1. Final pathology of the excised patellar tissue was consistent with gouty tophus. Follow up at 6 months showed interval healing of the patella fracture with satisfactory knee range of motion and excellent extensor mechanism function.

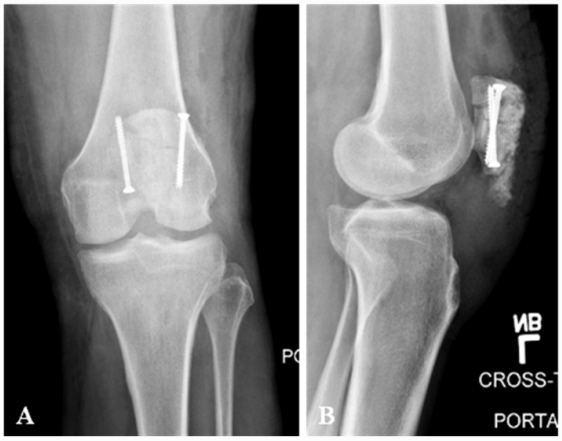

Figure 8: (A, B) AP and lateral post-operative radiographs of the repaired patella revealing two 4.0 mm partially threaded screws in place with adequate anatomic alignment and fixation.

Discussion

Gout is a relatively common crystallopathy that frequently demonstrates bony erosions about multiple joints. Clinically significant patellar erosions are rare, however it is likely under-reported. Although involvement of the patella and patellar tendon has been previously discussed in the literature, [14,15] only eight reports of associated patellar fracture have been reported [4,5,8,10,11,17]. Here, we describe a case of patellar fracture through tophaceous gout after relative minor trauma.

Gout erosions may closely mimic other tumor and tumor-like lesions of the patella [20,26]. In younger patients, a high suspicion for infection, chondroblastoma and giant cell tumor is appropriate, whereas patients older than 40 are more likely to present with metastatic disease or gout [20]. In addition to a thorough history and examination for evidence of other tophi, dual-energy CT scan is an important diagnostic imaging modality. Dual-Energy CT scan (DECT) is 90% sensitive and 83% specific in the diagnosis of gout, although its diagnostic accuracy is limited in patients with advanced knee arthritis or recent-onset gout [25]. Magnetic resonance imaging may also be helpful in defining the extent of soft tissue involvement and integrity of the surrounding structures [15]. Importantly, DECT may also be utilized to assess bone stock of the patella and aid in appropriate pre-operative planning.

The patient reported here required operative management due to complete disruption of the extensor mechanism. Intra-operatively, macroscopic examination revealed classic appearance of nodular, chalky material. Previously, patients were treated with open reduction and tension banding or, in one case, total patellectomy. Although one patient presented as non-union of a patellar fracture due to tophaceous gout, no issues with fracture healing after operative intervention in the setting of gout deposition has been reported [10].

Gout has been recognized as a cause of multiple pathologic fractures [16]. Here, we report a rare case of gouty involvement of the patella resulting in fracture after minor trauma. The patient was successfully treated with open reduction and internal fixation with two screws as well as bone grafting.

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