



## Pathologic Fracture of the Patella Secondary to a Gouty Tophus

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### Abstract

Gout is a rare cause of patellar fracture, with few documented cases. We report a case of gout tophi in the patella, the severe transverse fracture resulting from minor trauma. The patient was managed by the same treatment principles used for patients with non-pathologic patella fractures. We performed excising the mass, fixing the bone fragment and filling in bone defect with allograft bone. Union of the fracture was seen at three months follow-up. The patient has recovered completely and returned to his former work after 3 months postoperatively.

### Introduction

Fracture of the patella is relatively common, covering approximately 1% of all fractures. Pathological fracture of the patella caused by gout is pretty rare. Only sporadic published articles have reported pathological patellar fracture due to gout during the last several decades [1-9]. In this paper we report a case of gout tophi in the left patella and surrounding soft tissue, the severe transverse fracture resulting from relatively minor trauma. We performed removing the gout mass; reducing and fixing the bone fragment with longitudinal K wires; titanium cable and allograft bone graft for filling bone defect. The patient has recovered perfectly and returned to his former work at 3 months follow-up.

### Case Presentation

A 50-year-old gentleman with a history of gout slipped on the ground and had a low-energy fall on his left knee. He instantly experienced highly pain and swelling in the region of the left patella and was unable to bear weight on that leg. A physical examination showed a gross deformity of his patella, with tenderness to palpation over the patella. The patella floating sign was positive. The patient's Range of Motion (ROM) was limited to 30° passive flexion. His distal neurovascular examination was normal. Plain X-ray radiographs showed a transverse fracture of the patella with approximately 30 mm displacement. The margin of the space was irregular and no calcifications were observed. Computed Tomography (CT) confirmed the radiographic findings. Serial section imaging and 3D scan revealed that the bone in the distal part of the patella had been eroded (Figure 1). The serum uric acid levels at presentation were 11.2 mg/dL with the upper limit of normal being 7.0 mg/dL. He was originally diagnosed with gout ten years before this incident. He suffered the pain of the left knee one to two times each year and released after taking medication.

A standard midline longitudinal incision was made to expose the patella and retinaculum. We found a huge mass of chalky material, which had been divided into two parts by the injury, covering much of the surface of the patellar. A pole in the lower part of the patella was also occupied by the chalky white material. The chalky material had the appearance and texture of gouty tophus. The specimen was sent for pathologic confirmation. The chalky materials in bone and soft tissue were removed thoroughly. The patellar fracture was then reduced, and fixed with longitudinal K wires and a ring titanium cable. After fixation, there remained a large bone defect with a size about 15 mm × 15 mm × 20 mm in the lower part of the patella. The allograft bone was filled to the hole of bone defect area (Figure 2 & 3). The intraoperative ROM was approximately 100° flexion without any displacement or gapping of the fracture.

The tissue obtained from the patella was fixed in alcohol to allow for preservation of the diagnostic sodium urate crystals. Histologic evaluation revealed numerous large tophi composed of long, refractile, needle-shaped crystals. These crystals were focally surrounded by a granulomatous

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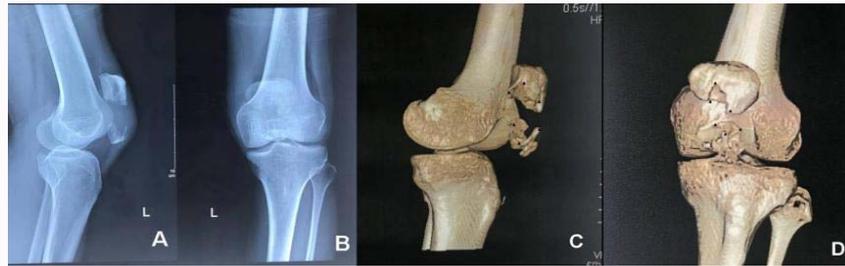
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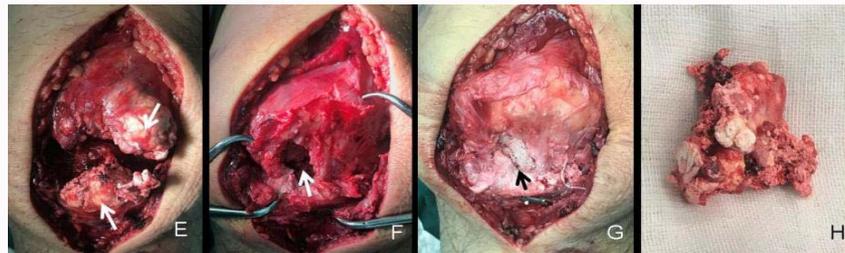
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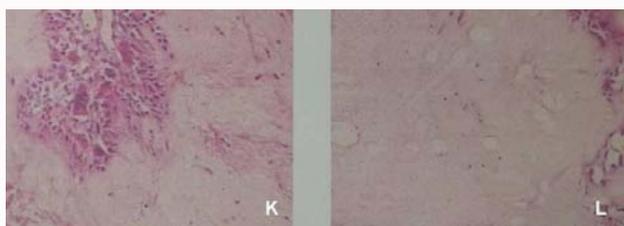
**Figure 1:** Radiographs (A, B) and CT scan (C, D) of the left knee revealed a transverse fracture of the patella with approximately 30 mm displacement and a large bone erosion in the distal part of the patella.



**Figure 2:** Intraoperative findings. E, a large mass of chalky material divided into two parts, covering much of the patellar surface. A pole in the lower part of the patella was also occupied by the chalky material. F, the chalky materials in bone and soft tissue were removed thoroughly. There remained a large bone defect with a size about 15 mm × 15 mm × 20 mm in the lower part of the patella. G, the patella was performed reducing, fixing with longitudinal K wires and a ring titanium cable and filling the bone defect hole with the allograft bone. H, the excised mass.



**Figure 3:** Intraoperative fluoroscopy (I, J) showed anatomical reduction of the patellar with satisfactory bone graft.



**Figure 4:** Histologic examination (K, L) showed granulomatous reaction and typical urate crystals.

reaction of histiocytes and foreign body giant cells in a background of fibrin, fibrous tissue, and reactive bone, confirming the diagnosis of gout (Figure 4).

After surgery, the left lower extremity was fixed with a knee immobilizer in extension for 3 weeks. Plain radiographs showed a good reduction of fracture (Figure 5). The incision healed well and the line was disassembled ten days postoperatively. Partial weight bearing and active assisted ROM were allowed after 3 weeks of operation. Based on intraoperative findings, the patient was prescribed allopurinol for presumptive treatment of gout. The patient had 0° to 120° range of knee motion with 2 months follow-up. Union of the fracture was



**Figure 5:** Radiographs (M, N) of the left knee taken 3 months postoperatively show bone healing of the patellar.

seen at 3 months follow-up. The patient has recovered perfectly and returned to his former work after 3 months postoperatively.

The patient was informed that data obtained from the case would be submitted for publication and gave his consent.

### Discussion

Gout is a common rheumatologic disorder, accounting for approximately 5% of all patients with arthritis. The knee is the third most commonly affected site in gout after the foot and ankle [10]. However, isolated patellar involvement, especially leading to the patellar fracture, was rarely reported [1-9]. Tophaceous gout of the patella was first reported by Peloquin and Graham who in 1955 described a patient with erosion of the patella at surgery [11]. In 1986, Greenberg reported the first case of pathologic patella fracture caused by gout [1]. Espinosa-Morales and Escalante reported the case

of a patient in whom gout was diagnosed to explain the cause of a patella fracture non-union [3]. In 2006, Nassim A described a patient who sustained atraumatic bipartite patellar fracture secondary to gout [5]. In 2011, Chen D and Jiang Y reported a case of gout tophi in the left patella and surrounding soft tissue, the severe splintered fracture resulting from relatively minor trauma. They preformed total patellectomy [8].

The mechanisms of gouty tophus fracture are still unknown. Intraosseous tophi is much less common, but is becoming recognized as a possible cause of fracture in patients with gout [6]. Urate crystals can contribute to bone lesions by reducing osteoblastic activity and are associated with enhanced osteoclast activity in the vicinity of tophi [12,13]. Intraosseous crystal deposition in the patella could enhance bone erosion leading ultimately to bone fragility and fracture [8].

The differential diagnosis of osteolytic lesions of patella includes infection, degenerative conditions, metabolic diseases, and tumors. Recht MP [14] presented seven patients who had patellar gout unilaterally (six patients) or bilaterally (one patient) and found that the bone erosion of 7 cases were all located on the superolateral portion of the patella. Therefore the authors considered that an osteolytic lesion of the superolateral portion of the patella, especially when associated with a peripatellar calcified soft tissue mass, should alert one to the possible diagnosis of gout. However, the osteolytic lesion was located on the distal portion of the patella in our patient. The osteolytic lesion can reduce bone stock and subsequently induce pathological fracture resulting from relatively minor trauma.

Except for total patellectomy due to large erosion and severe comminuted fracture [8], almost all the published articles reported that the patients with patellar fracture secondary to gout all followed the same treatment principles adopted to non-pathologic patella fractures. We consider that bone grafting is necessary for large bone defects of the patella. In order to avoiding the injury of autogenous bone graft, we chose allogeneic bone grafting. Our patient had a good recovery of the knee function with complete healing of the fracture 3 month postoperatively.

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