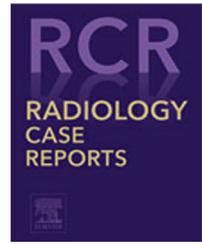
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Case Report

Case report of a tibial fracture in a patient suffering from gout: An atypical site, the importance of differential diagnosis^{1,2}

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ARTICLE INFO

Article history:

Received 15 December 2021

Revised 2 January 2022

Accepted 5 January 2022

Keywords:

Diagnosis, Differential

Gout

Fractures, Spontaneous

Neoplasms

Knee Joint

ABSTRACT

We present the case of a 60-year-old man with a history of severe tophaceous gout with polyarticular involvement who came to the emergency room due to direct trauma to the right forearm and knee. The knee X-ray and CT scan showed a lateral tibial plateau fracture characterized by the presence of a lytic bone lesion. The presence of a solid neoplasm was ruled out and a CT-guided biopsy was performed. Histological evaluation revealed findings typical for an advanced intraosseous gout. As there was no significant risk of progression of the lytic lesion, the fracture site was treated conservatively. This case is unique in the literature in terms of location and should be considered as an atypical site of intraosseous gout. Proper differentiation of a pathological fracture on an intraosseous gout location from a neoplastic lesion is essential to choose the correct therapy.

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Case report

Background

Gout is a common inflammatory disease caused by microcrystal deposition with an increasing incidence in Western populations due to the increase in predisposing conditions and risk

factors such as metabolic syndrome. The disease is characterized by a state of hyperuricemia (caused by hypo excretion or overproduction of uric acid) resulting in intra-articular deposition of urate crystals. Bone erosion is a frequent occurrence in the joint manifestation of gout and has distinctive features that allow it to be diagnosed either by radiography or CT scan. Based on the few cases described in literature, the most frequent sites of pathological gouty fracture are the femoral neck

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¹ Competing Interests: The authors declare that there is no conflict of interest regarding the publication of this article.

² Funding: No grant or funding were received for this study.

<https://doi.org/10.1016/j.radcr.2022.01.005>

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Fig. 1 – Radiography acquired in latero-lateral (A) and antero-posterior (B) projection. At the lateral tibial plateau there is a radiolucent approximately round gap (arrowheads) where a fracture (arrow) has occurred. In this case the initial diagnosis was a pathological fracture

and the patella. To our knowledge a tibial fracture due to intraosseous gout has never been described. We report a case of atypical location of gout simulating a neoplastic lesion.

Case Presentation

We present the case of a 60-year-old man with a history of severe tophaceous gout with polyarticular involvement treated with colchicine and phlebotomy for about 9 years. The patient came to the emergency room following a syncopal episode with a ground fall and direct trauma to the right forearm and knee.

At clinical evaluation, the patient was unable to stand due to knee pain and, for this reason, an X-ray study of the joint was requested. The blood tests on admission showed no significant alterations except for a modest reduction in hemoglobin (9.8g/dl) in a picture of multifactorial anemia related to renal insufficiency and iron deficiency and a slight increase in creatinine (1.29mg/dl) and lactate dehydrogenase (247U/L).

The knee X-ray (Fig.1) showed a lateral tibial plateau fracture characterized by the presence of a lytic bone lesion. The fractured limb was initially protected with a plaster cast as the diagnostic process continued. A non-contrast CT scan was then performed with the dual purpose of better defining the morphology and degree of intraarticular extension of the fracture as well as the matrix characteristics of the lytic lesion.

The CT confirmed intraarticular fracture extension to the lateral tibial plateau and both intercondylar spines and confirmed the presence of a focal lytic lesion with dimensions of 29 × 27 × 26mm and non-sclerotic "map-like" margins, determining cortical bone thinning along the tibial posterior aspect (Figs. 2B, C and, D). There was no evidence of periosteal reaction or signs of trabecular oedema. The lesion matrix

showed solid characteristics (variable density between 50–90 HU) without evidence of intralesional calcifications. A picture of severe osteoporosis, diffuse vascular calcifications of the popliteal axis and a fair amount of intra-articular effusion were also described.

Beside ultrasound showed the presence of diffuse periarticular microcrystalline deposits on the patellar cartilage and on both menisci, without signs of active synovitis, characteristic of the known disease apparently not in active stage.

To exclude the presence of underlying solid neoplasm, the patient underwent a total body CT scan with contrast medium. However, the presence of macroscopic tumor lesions could not be documented. Tumor markers, free chains and Bence-Jones protein assays performed later also proved negative and ruled out the presence of multiple myeloma or a solitary plasmacytoid lesion.

Hence the indeterminate nature of the lesion, biopsy was essential to ascertain with certainty its nature. A CT-guided biopsy (Fig.2a) was then scheduled and performed approximately 45 days after diagnosis by an interventional radiologist. An 18G biopsy needle was used with a posterior-lateral approach with prone patients and 3 tissue samples were taken.

While waiting for the biopsy, control X-rays did not show any misalignment of the fracture segments and the patient was progressively weaned from the plaster cast, first with an articulated brace, introducing physiotherapy and, later, also with load allowance (about 2 months after the traumatic event). (Fig.3)

Histological evaluation revealed the presence of polycyclic aggregates of crystalline material surrounded by macrophages and giant cells within a trabecular bone with extensive osteoclastic rearrangement. The findings were typical for an advanced intraosseous gout (intraosseous gouty tophus).

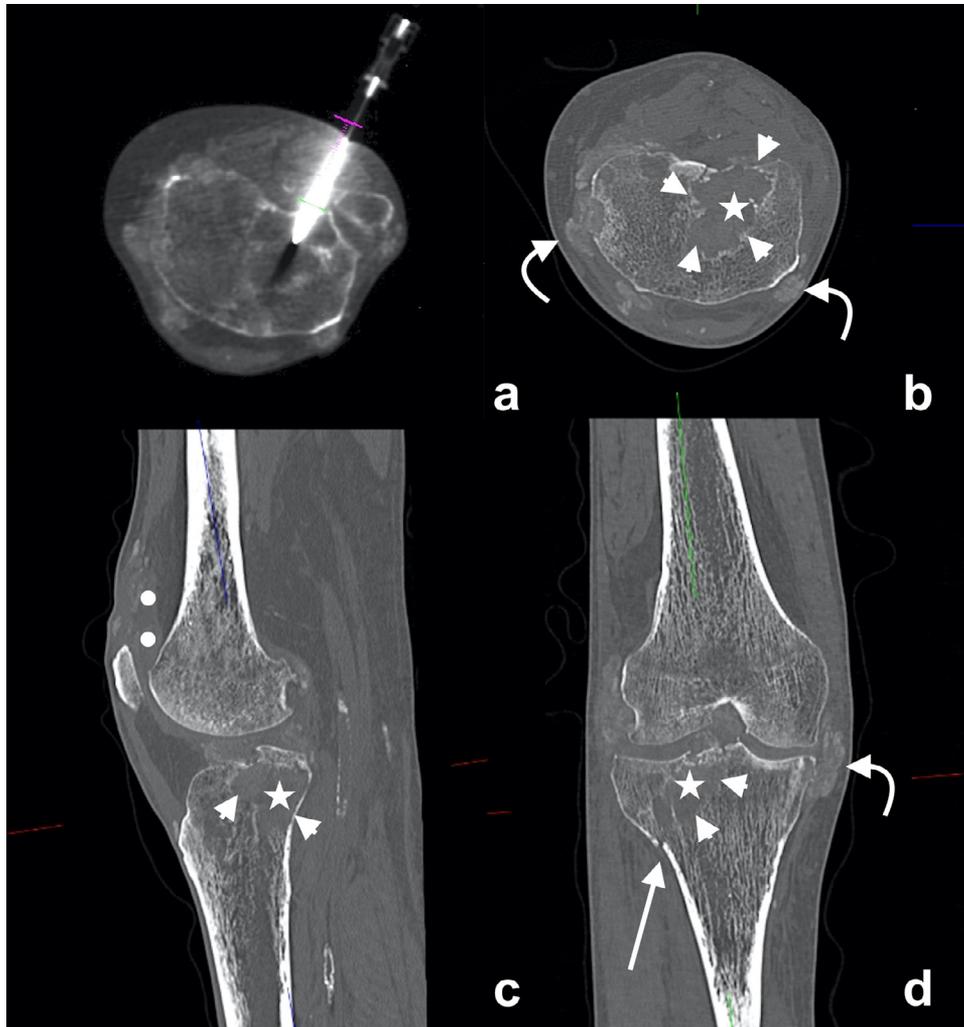


Fig. 2 – CT study performed as confirmatory diagnostic examination following radiography (A,B,C). The study was performed in an urgent fashion without administration of iodinated contrast agent. In images (A), (B) and (C) the lytic lesion at the proximal epiphysis of the tibia is clearly evident (arrowheads) occupied by dense, solid-looking material (star). The CT scan confirms the presence of the pathological fracture already evident on the radiographic examination (arrow). It also showed the presence of joint effusion (white dots) and accumulations of slightly hyperdense material in the extraarticular region (curved arrows). The definitive diagnosis required a CT guided biopsy (D)

As there was no significant risk of progression of the lytic lesion, given the patient's general condition and the nature of the lesion, the fracture site was treated conservatively by prescribing progressive loading and better control of the underlying disease by medical therapy. At 4 months, the clinic was good, he could walk painlessly, and his articular range of motion was complete. X-ray examination showed complete consolidation of the fracture

Discussion

Bony hyperlucency on standard radiographs is the first step to a wide range of diagnoses. Differential diagnosis includes degenerative, infectious, inflammatory, metabolic and tumoral changes.

Bone erosion is a frequent occurrence in the joint manifestation of gout. The bone lesion appears lytic, with sharp margins without buttress reaction; sometimes interruption of the bony cortical may be observed.

Tophi are seen as discrete masses with a density of 160–170 HU. In recent years, Dual Energy CT (DECT) has emerged as a useful tool in the diagnosis of gout. Several studies have proven the utility of DECT in assessing urate deposits among patients with tophaceous gout, providing noninvasive diagnosis and also estimating tophus volume with good reproducibility. In some researches, DECT found high sensitivity (0.90) and specificity (0.83) for diagnosing gout versus other types of inflammatory arthritis [1]. It has also been included in the 2015 ACR/ EULAR Gout Classification criteria [2]

Gout is undoubtedly a widespread condition with an incidence of 1.4:1000/y in women and 4:1000/y in men (gender ratio F:M = 1:2,8) [3], while advanced manifestations of the



Fig. 3 – Radiography acquired in antero-posterior (A) and latero-lateral (B) projection. Fracture follow-up at four months after trauma, with the patient correctly treated pharmacologically, demonstrated complete healing of the fracture site

disease are less and less frequent. It predominantly affects young adults (median age: 28 years) and often correlates with 1 or more of the following risk factors: hyperuricemia, genetic factors, dietary factors, alcohol consumption, metabolic syndrome, diuretic use, renal disease [3].

The treatment is based on non-steroidal anti-inflammatory drugs (NSAIDs) and colchicine in the acute phases, shifting to long-term urate-lowering therapy in the chronic setting.

Medical therapy can in fact control blood uric acid levels by preventing the deposition of crystals in the joints, excretory system and soft tissues of the body [4]. Tophi not usually appear on physical or radiographic examination until 10–12 years after onset of gout.

Evidence of a pathological fracture cannot avoid including in the diagnostic pathway the exclusion of possible primary tumor lesions or the presence of a plasma cell lesion.

In the present case, the finding of atypical site of gout was evident, but the extreme rarity of a tophaceous intraosseous tibial lesion (never reported) made it necessary first to exclude the most probable differential diagnoses and then to confirm the presence of uric acid crystals in the intraosseous site.

The presence of urate crystals seems to cause a reduction in osteoblastic activity in favor of osteoclastic activity. Repeated minor traumatic events in the anatomical regions affected by the presence of gouty tophi could stimulate the release of these crystals, leading to bone erosion and subsequent fragility fractures [5].

Although reported articles have demonstrated an increased prevalence of fractures especially in certain categories of gout patients [6], the authors generally agree that the disease is not associated with an increased fracture risk, and that medical therapy aimed at reducing uric acid has no obvious benefit in preventing significant skeletal events [7–9].

In addition, the cases of tophaceous fractures described in the literature were predominantly located in the patella, femoral neck and hip [5,10–12].

Another key aspect is the importance of careful differential diagnosis between gouty and neoplastic processes. While high uric acid levels in association with clear radiological findings may avoid biopsy, it must be considered necessary in case of low uric acid levels [10,12,13]. The differential diagnosis is essential because the treatment of secondary bone neoplastic lesions and myeloma is obviously different from that of gouty lesions. Leaving aside the systemic aspects, which include staging and treatment of the primary tumor with possible indications for chemotherapy, radiotherapy, or immunotherapy, it is necessary to consider that bone metastases of the long bones often lead to pain and pathological fractures. Local treatment consists of radiotherapy or surgery and treatment strategies are strongly based on the risk of the fracture and expected survival.

Main surgical treatment options to choose from are plate fixation, intramedullary nails and (endo) prosthesis. The choice among those depends on the localization, extent of involved bone, and expected survival. In case of large lesions adjuvant cement should be considered in for better stabilization [14].

The aim of palliative surgery is usually to eliminate pain and to allow the patient to regain his/her mobility as well as to improve the quality of life through minimally invasive techniques using life-long durable devices [15].

Conversely, according to the literature, the treatment of intraosseous gouty lesions is significantly different. Conservative medical treatment has to be the first treatment choice, whereas surgery of intraosseous tophi lesions should be performed only in cases of chronic pain resistant to medical therapy, in case of complications such as over infection, in cases of destructive arthritis or in cases of rapidly growing gouty tophi [15].

The presence of gouty tophi at the large joints may, in fact, cause chronic pain, necessitating surgical treatment of these lesions. The first-choice therapy for painful gouty tophi is curettage and bone grafting. Significant joint erosion may, however, weaken the bone, necessitating preventive osteosynthesis treatment, always combined with medical therapy to control blood levels of uric acid [16].

In case of delayed surgery, the first choice treatment is the curettage of the lesions, leaving prophylactic osteosynthesis only for the rare cases of major bone erosion [17]. In our case, the patient's pain resolved within two weeks after the trauma and, once a definite diagnosis of intraosseous gout was obtained, he was treated conservatively in line with the methods described in literature. In our case, the decision for conservative treatment was made for several reasons such as the patient's comorbidity and the "fracture personality" which appears to be stable.

Generally speaking, local prognosis is good but it must be taken into account that gout appears to be an independent risk factor for all-cause mortality and cardiovascular disease mortality and morbidity [3].

Conclusion

This case reports of an atypical site of intraosseous gout. Proper differentiation of a pathological fracture on an intraosseous gout location from a neoplastic lesion is essential to choose the correct therapy. The treatment of a fracture arising on a gouty tophus is not dissimilar to that of a simple traumatic fracture.

Patient consent

Written informed consent was obtained from the patient.

Human and animal rights

Ethical approval has been exempted by our institution as this publication is a case report and not a randomized trial or a case series, provided that the patient gave her written consent both for operation and the publication of this case.

Ethics approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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