



Case report

Total knee arthroplasty in a patient with ipsilateral calcific myonecrosis

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ABSTRACT

Calcific myonecrosis (CM) is a rare soft tissue condition associated with previous trauma that presents with a large lower extremity mass and can be misdiagnosed as a malignancy. Biopsy, accidental entry, or disturbance to the lesion can be accompanied by a high risk of complications. We present the case of a 72-year-old man with severe post-traumatic knee arthritis, as well as a large pretibial mass consistent with CM, who successfully underwent total knee arthroplasty. To our knowledge, this is the first report focusing on total knee arthroplasty in a patient with CM and we discuss considerations for evaluation, tourniquet usage, component positioning and placement, postoperative care, and range-of-motion expectations.

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Introduction

Calcific myonecrosis (CM) is a rare, post-traumatic soft tissue condition characterized by the formation of a slow-growing, dystrophic calcified mass. Such lesions, often occurring within the anterior compartment of the lower limb, are believed to arise from tissue ischemia and sensory deficits resulting from compartment syndrome; the compartment syndrome typically occurs many years prior to the development of the mass [1,2]. This very uncommon condition is relevant to orthopedists because it may mimic a malignant condition [2] and also because surgical intervention for CM is accompanied by a high risk of complications [3]. Even biopsy is associated with complications [3]. For these reasons, recognition of this condition is of paramount importance, and conservative management is recommended. In cases where ipsilateral limb surgery is indicated, these issues must be taken into account.

Patients with CM therefore present a unique challenge for the arthroplasty surgeon. Due to their high risk of poor healing, chronic drainage, and infection if the CM lesion is entered or significantly disturbed, CM patients are at higher risk than usual for elective surgery. The mass may also affect cutting guide placement and postoperative rehabilitation, and the trauma associated with the original injury may negatively impact the surgery and recovery. To our knowledge, there are currently no clinical cases or recommendations that exist for patients with CM undergoing total knee arthroplasty (TKA). Here, we report the case of a patient with CM who successfully underwent an elective TKA and discuss considerations for evaluation, tourniquet usage, component positioning and placement, postoperative care, and range-of-motion expectations.

Case history

A 72-year-old man presented with severe left knee pain, deformity and dysfunction, and a chronic pretibial soft tissue mass.

Forty-seven years prior, the patient had sustained a severe trauma in a motorcycle accident, and states that his knee had a probable multiligament instability (knee dislocation) or fracture dislocation. His leg was splinted initially, and then casted, and he remained in the hospital for over 1 month. He does not recall being

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diagnosed with compartment syndrome, and did not have surgery at that time. He vaguely remembers having numbness after his injury, but that this resolved gradually. He does not recall the distribution, and is unsure of any transient weakness.

After healing, his knee was functional but stiff and painful. Approximately 10 years prior to presentation, he noticed an anterior soft tissue mass. It grew very slowly, and was not painful. He did not seek a formal diagnosis, and the mass has remained stable over the last 2 years.

At presentation, the patient's knee pain was sharp in nature and was associated with locking and give-way episodes. Symptoms were aggravated by activity in general, specifically knee twisting, push-pull motions, climbing stairs, and getting in or out of the car. Additionally, symptoms were alleviated by nonimpact exercises and activity modification. On examination, the patient's gait was antalgic to the left and his right leg appeared longer than the left. He had bilateral genu varum, more so on the left side. Tenderness over both the left knee lateral and medial joint lines was severe. His passive range-of-motion of his left knee was from 20° of flexion to 110° of flexion. There was no laxity in the anterior-posterior or medial-lateral planes, and no evidence of rotatory instability. Preoperative Knee Society Knee Score was 18 and Knee Society Function Score 45 [4].

The mass on the patient's tibia was fusiform and soft, and located anterolaterally. The apex appeared to be just proximal to the middle of the lower leg. Skin over the mass was intact, and there was no erythema or tenderness. Of note, the mass did not seem to move with ankle dorsiflexion, extension, inversion, or

eversion. Motor and sensory functions were grossly intact in the foot. The dorsalis pedis and posterior tibial pulses were palpable and symmetrical with his contralateral foot.

Past medical history was positive for hypertension, premature ventricular contractions, post-concussion syndrome, and nephrolithiasis. Furthermore, the patient had undergone a left knee arthroscopy in the distant past. Apart from the patient's chief complaint, he appeared well and denied any constitutional symptoms.

Examination and review of bilateral knee and lower extremity radiographs revealed advanced arthritis and left medial tibial bone loss, as well as bilateral knee varus alignment. On the lateral radiograph, posterior tibial translation was apparent, as was patella baja. The images suggested a prior proximal tibial fracture, including a possible prior fracture on the notch view and an anterior tibial slope on the lateral view (Fig. 1). Additionally, a large pretibial mass with speckled calcifications was seen. Because the patient's pretibial mass had not been characterized, further evaluation with dedicated tibia radiographs and computed tomography (CT) scan was warranted (Fig. 2). Magnetic resonance imaging (MRI) was not obtained, as the radiologist was confident of the diagnosis based on history and CT imaging.

The workup was consistent with the diagnosis of a CM and biopsy therefore contraindicated [1]. The history of distant severe trauma and the slow-growing nature of the mass were important historical factors and the musculoskeletal radiologist confirmed this diagnosis. After a shared decision-making discussion, including the potential increased risks of surgery associated with an



Figure 1. Preoperative left knee radiographs. Bilateral anteroposterior (a), left standing posteroanterior flexion (b), Merchant (c), and left lateral (d) knee radiographs. Note medial tibial bone loss and varus deformity. Posterior tibial translation and patella baja are evident on the lateral view. The images suggested a prior proximal tibial fracture, including a possible prior fracture on the Merchant view and an anterior tibial slope on the lateral view. Standing bilateral (e) radiographs show bilateral varus deformity (left greater than right) and speckled calcification within the left pretibial mass.

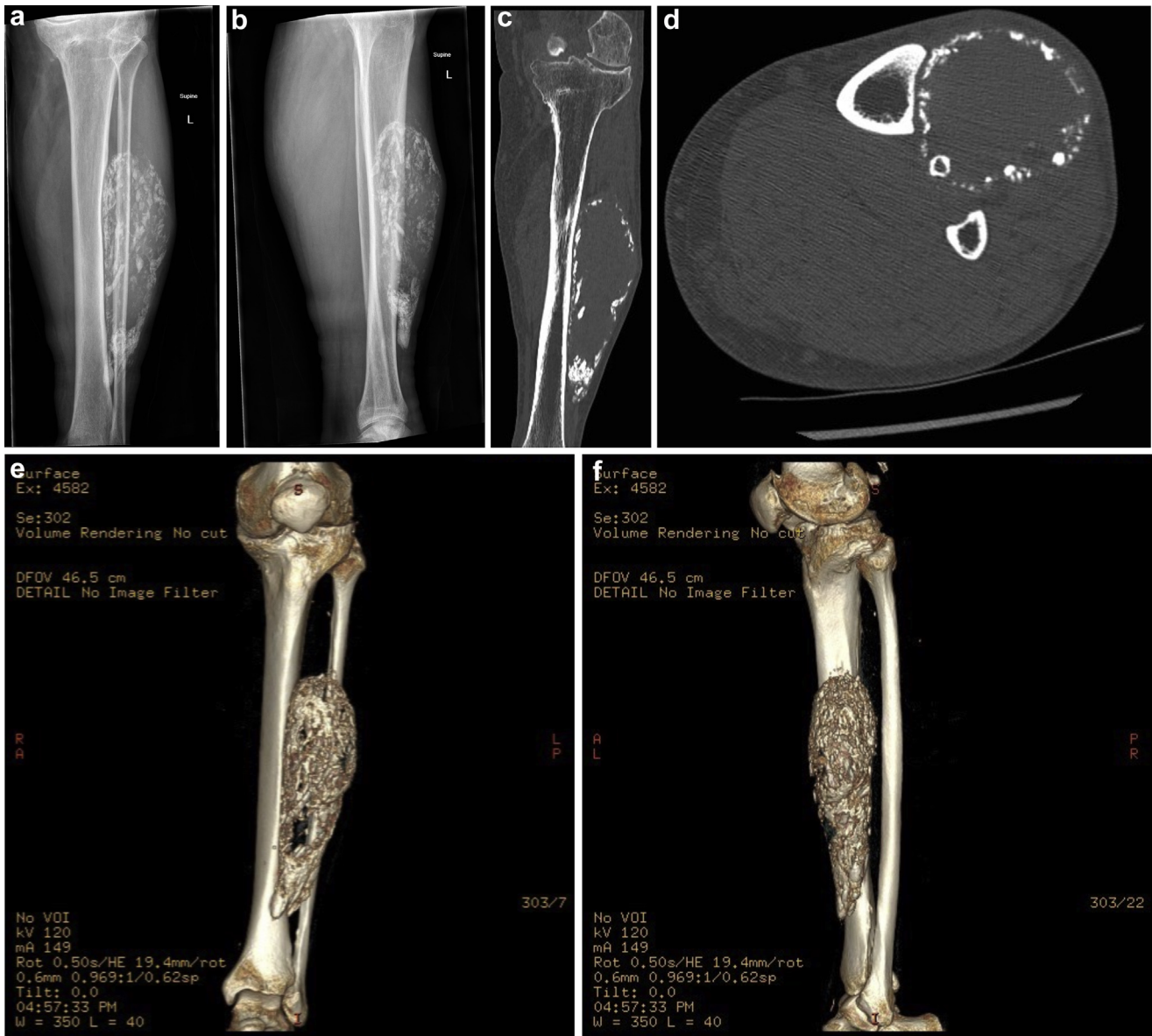


Figure 2. Radiographs and CT scan of patient's lower extremity to characterize mass. Anteroposterior (a) and lateral (b) tibia/fibula radiographs showing large anterior soft tissue mass with speckled calcifications. CT coronal (c) and axial (d) as well as 3-dimensional anteroposterior (e) and lateral (f) reconstruction views demonstrating anterior compartment mass with peripherally oriented amorphous calcifications, which are linear and sheet-like. The center is homogeneous.

ipsilateral CM lesion, the patient was offered a fixed-bearing, posterior cruciate-substituting cemented TKA NexGen Legacy (Zimmer Biomet, Warsaw, IN). More constrained options were available, but not necessary, at the time of surgery.

Anesthesia incorporated multimodal pain management, including an adductor canal nerve block, and laryngeal mask airway general anesthesia. At the time of surgery, modifications to the surgeon's usual hybrid measured resection/gap balancing TKA technique included the following: avoiding exsanguination of the lower leg; using the tourniquet only for the cementation portion of the surgery; taking care of the extramedullary tibial guide to account for the soft tissue mass and not allow this to affect tibial slope or coronal alignment; being cognizant during exposure and with soft tissue balancing releases not to enter the CM lesion; and using antibiotic bone cement.

The patient did well postoperatively, and had no specific restrictions. Compression stockings and mechanical compression

devices were used for his 2-day hospitalization, and he had 6 weeks of low-dose aspirin for deep vein thrombosis prophylaxis. Two-week radiographs demonstrated satisfactory alignment and cement interdigitation. There was patellar baja consistent with this same preoperative post-traumatic finding. One-year postoperative radiographs and clinical photographs (Fig. 3) demonstrate satisfactory alignment, passive range-of-motion of 0°–110° of flexion, and no change in the CM mass. His 1-year Knee Society Knee Score was 90 and Knee Society Function Score was 100 [4].

The patient consented to us submitting this case report, and this work is Institutional Review Board exempt.

Discussion

In this report, we present the case of a 72-year-old man with severe post-traumatic knee arthritis, as well as a large pretibial

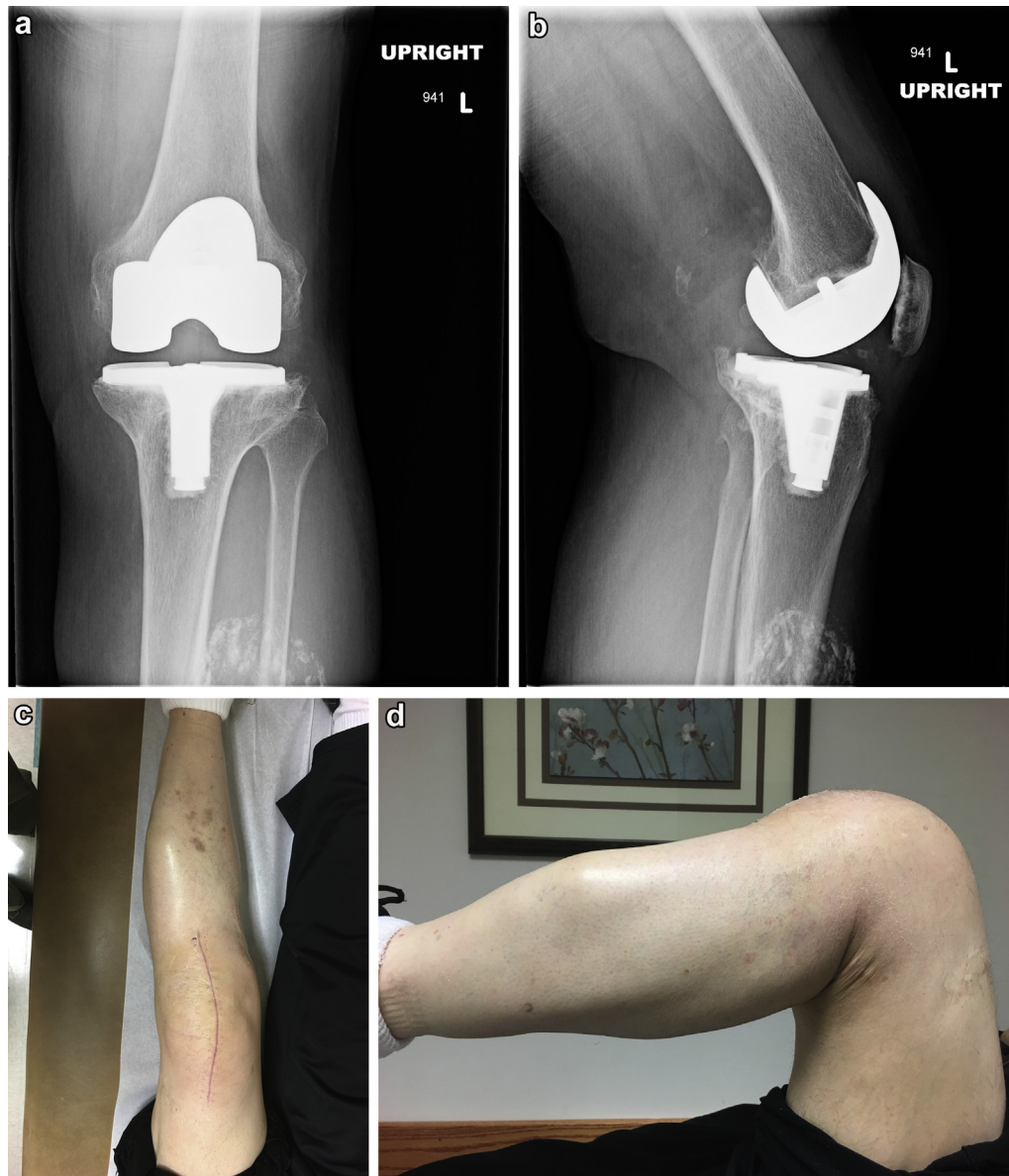


Figure 3. Anteroposterior (a) and lateral (b) views at 1 year postoperatively. Note satisfactory alignment and cement interdigitation, with patella baja. Front (c) and side (d) clinical photographs show a well-healed incision, satisfactory alignment, and range-of-motion.

mass consistent with CM, who successfully underwent TKA. To our knowledge, this is the first report focusing on TKA in a patient with CM, a very rare and benign post-traumatic mass that may lead to complications if biopsied or disturbed. The history of distant severe trauma, and the late onset and slow-growing nature of the mass were important historical clues as to the diagnosis. Complete radiographic and 3-dimensional imaging further aided in the diagnosis of CM, and by virtue of this diagnosis biopsy was contraindicated [1]. Further laboratory workup and evaluation to rule out metastases were also unnecessary.

Radiographs and CT are typically sufficient to make the definitive diagnosis of CM, in conjunction with the patient's history. Indications for MRI, as well as the typical MRI findings in CM, are reviewed in the radiology literature [1]. In our patient, the musculoskeletal radiologist was confident of the diagnosis of CM based on history, radiographs, and CT. If the reconstructive surgeon has any question as to the diagnosis, consultation with a musculoskeletal oncologist is indicated.

Because of the large volume and location of the mass in our patient, as well as the importance of avoiding rupturing or entering it, modifications to the surgical procedure were warranted. We chose to use the extramedullary tibial guide and modify its use to avoid altering the tibial cut; another possibility would have been to use an intramedullary guide or patient-specific cutting guides, with preoperative CT or MRI analysis. Robotic navigation was yet another consideration, but may have been inappropriate because of the location of pin placement in the tibia. Minimal tourniquet TKA is becoming more common in TKA in general [5], and was very useful in this instance. We were concerned that exsanguination of the limb could have ruptured the CM mass, so we used the tourniquet for cementation only. This allowed for excellent cement interdigitation, particularly on the sclerotic medial tibia. We chose to use antibiotic bone cement as there are reports of de novo infection of CM lesions [6], and antibiotic cement theoretically may protect the patient's knee implant. The use of tranexamic acid and careful intraoperative hemostasis prevented excessive blood loss or the need for transfusion.

Although the patient was very satisfied with his outcome, the range-of-motion was not ideal at the 1-year follow-up. This was likely related to his preoperative limitations [7], and scarring from post-traumatic arthritis as evidenced by patella baja, preoperatively. It is also possible that the patient's CM mass, and the desire not to disturb or rupture it, contributed to the diminished range-of-motion. Avoidance of aggressive soft tissue releases and forceful intraoperative ranging of the knee may have incompletely released prior scarring. Ultimately, careful follow-up of the mass with consultation with a musculoskeletal oncologist if necessary, as well as surveillance follow-up of his TKA will be very important.

Summary

CM, a rare soft tissue condition associated with previous trauma, can present a unique challenge for the orthopedic surgeon. The usually large lesion with speckled calcifications may be misdiagnosed as a malignancy and biopsy, accidental entry or disturbance to the lesion can be accompanied by a high risk of complications. In the present case report, a 72-year-old man with severe post-traumatic knee arthritis, as well as a large pretibial mass consistent with CM, successfully underwent TKA. Appropriate

preoperative diagnosis and TKA modifications including avoiding exsanguination and minimal tourniquet usage, careful usage of the extramedullary tibial guide, soft tissue releases that do not enter or disturb the CM mass, and antibiotic bone cement are all helpful for a very good result. To our knowledge, this is the first report focusing on TKA in a patient with CM.

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