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Case Report

Localized Tenosynovial Giant Cell Tumor After Total Knee Arthroplasty

Nicket Dedhia, MD[a], Diego Zamata-Ovalle, BS[b], Emma Johnson, MD[a], Evan Schwechter, MD[a, *]

[a] Department of Orthopaedic Surgery, Montefiore Medical Center, Bronx, NY
[b] Albert Einstein College of Medicine, Bronx, NY

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ABSTRACT

Tenosynovial giant cell tumor (TGCT) occurs in both diffuse and localized forms. While diffuse TGCT is an uncommon but well-described complication after total knee arthroplasty (TKA), localized TGCT has only once been previously described as a postoperative complication after TKA. We report on the diagnosis and management of a patient who developed postoperative localized TGCT after routine TKA and underwent uncomplicated removal. Postoperatively the patient noted a resolution of pain and mechanical symptoms. Early consideration of this rare occurrence after TKA can prevent significant pain and disability due to delayed diagnosis.

Introduction

Tenosynovial giant cell tumor (TGCT) encompasses a set of rare soft tissue tumors that were previously described in medical literature as giant cell tumor of the tendon sheath, nodular tenosynovitis, diffuse-type giant cell, and pigmented villonodular synovitis. Under the newly-adopted nomenclature, TGCT can be subdivided into 2 categories: localized TGCT (L-TGCT) and diffuse TGCT (D-TGCT). D-TGCT is more common among women and affects a younger population. Nearly equal proportions of men and women are affected by L-TGCT with a median age of 47 years old [1,2].

Both L-TGCT and D-TGCT have been defined as monoarticular diseases involving different joints; the knee is most commonly affected, followed by the ankle and hip overall. D-TGCT is often accompanied by hemarthrosis and usually involves the majority or entirety of large joints such as the knee and hip. The diffuse subtype is an aggressive tumor that can metastasize to the lungs. Radiographic findings may resemble those of osteoarthritis such as joint space narrowing, subchondral sclerosis, and osteophytes, in addition to pressure erosions.

While both L-TGCT and D-TGCT can present similarly with symptoms including pain, swelling, and stiffness, L-TGCT can occur with more mechanical symptoms such as locking, catching, and instability [3]. L-TGCT is characterized as a slow-growing painless mass, usually found in the digits, that is well-defined (encapsulated) and well-localized to a particular section of the synovium [4,5]. Imaging often reveals solitary subcutaneous soft tissue nodules with low T1 and T2 signals and moderate enhancement [5]. L-TGCT is benign and generally noninvasive.

Ultrasound, although nonspecific, may reveal hypoechoic irregular synovial thickening along with heterogenous joint effusion and hyperemia [6]. Tissue changes indicating TGCT can be appreciated on magnetic resonance imaging (MRI) due to hemosiderin deposition, while the presence of tissue calcification may indicate an alternative diagnosis [4-6]. Histology is diagnostic; however, imaging is often needed to differentiate L-TGCT from D-TGCT.

Several studies exist regarding the use of total knee arthroplasty (TKA) as a treatment for patients previously diagnosed with TGCT [7-9]. However, literature review identifies only one case of L-TGCT after TKA. Herein, we describe a new case presentation of L-TGCT after TKA.

Case history

A 58-year-old male presented in October 2020 with left knee pain for 1 month. He had a past medical history of hypertension, stage 2 chronic kidney disease, hyperlipidemia, and gastroesophageal reflux. Several months after presentation, in March 2021, after

* Corresponding author. Department of Orthopaedic Surgery, Montefiore Medical Center, 1250 Waters Place, Tower 1, 11th Floor, Bronx, NY 10461, USA. Tel.: +1 347 577 4410.
E-mail address: ESchwech@montefiore.org

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failure of conservative treatment, the patient underwent a medial partial meniscectomy. One month postoperatively, the patient reported difficulty with knee flexion and significant swelling. Aspiration at the time yielded 60 cc of yellow serous fluid without complications. He underwent several rounds of unremarkable aspirations but reported corticosteroid injections failing to relieve pain and mechanical symptoms interfering with activities of daily living.

He was indicated for and underwent TKA in September 2021 with a Zimmer Biomet Persona System (Warsaw, IN). Surgery was uncomplicated, and the patient was discharged. Immediate postoperative imaging demonstrated a well-positioned and well-fixed TKA. The patient was discharged home after an uneventful hospital stay that included physical therapy assessments and clearance.

Reports of diffuse pain in the anterolateral knee radiating to the thigh and hip were noted at his 6-month postoperative visit.

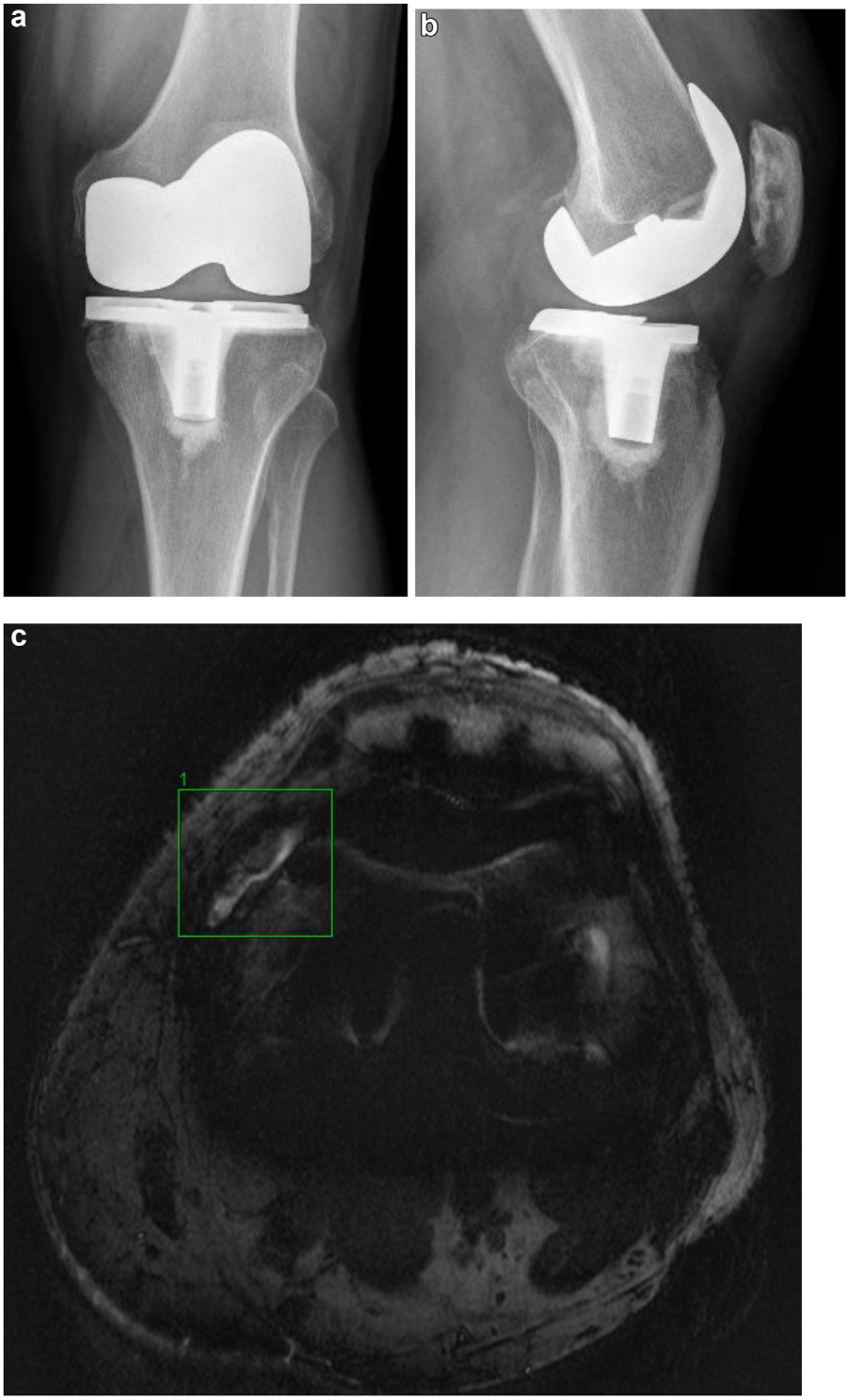

Figure 1. Preoperative imaging including (a) anteroposterior and (b) lateral radiographs and (c) metal subtraction MRI prior to exploration and resection demonstrating the lesion.

Imaging (including radiographs and subsequent MRI for observed resorption at the medial tibial plateau) at the time was remarkable for mild focal marrow edema, diffuse quadriceps tendon and patellar tendon thickening, and moderate knee joint effusion with mild synovitis. The patient followed close observation and was prescribed a Medrol Dosepak with a possible associated sciatica component given the lateralized thigh pain (which he chose to forego). At this time, he was referred for spine surgery evaluation, which led to a diagnosis of lumbar radiculopathy treated with conservative management.

One year postoperatively, the patient returned for follow-up after an episode of knee locking that prevented extension after sitting in an airplane. He reported persistent pain, and radiographs demonstrated suprapatellar effusion without evidence of prosthetic loosening. In the following 3 months, the patient reported progressively worsening of the pain, more on exertion and with minimal improvement with conservative measures including anti-inflammatory medications and physical therapy. A bone scan done at 16 months after TKA suggested loosening of all implant components; however, this finding was inconsistent with his clinical picture of painless ambulation without start-up pain, pain with weight-bearing, or instability at the time of the scan.

At the 22-month follow-up visit, the patient returned for a tender mass along the medial aspect of the knee. MRI at the time demonstrated quadriceps and patellar tendinopathy as well as an anteromedial knee mass (Fig. 1). Ultrasound imaging revealed a subcutaneous, fairly homogenous, hypoechoic mass without internal flow measuring 2.2 × 2.2 × 2.8 cm (Fig. 2). This was followed by an attempted aspiration, which yielded no fluid. At this time, the patient was indicated for operative exploration, and an open arthrotomy revealed a 4 × 3 × 1 cm firm, nodular, subfascial mass adjacent to the medial joint line that was excised using electrocautery (Fig. 3). Open arthrotomy was utilized over arthroscopic exploration due to surgeon preference and desire for thorough exploration for the patient's longstanding complaint. Histopathology results confirmed TGCT with gross appearance as a yellow homogenous lesion. Recovery was uneventful, and the patient reported no symptoms 7 months postoperatively.

Discussion

We outline the clinical presentation of a L-TGCT following TKA. While several case reports exist regarding development of D-TGCT after TKA, there is only one other report of postoperative diagnosis of L-TGCT [10-12]. In this report, a 71-year-old woman presented with persistent atraumatic knee pain and swelling 15 months after right TKA. The diagnosis was confirmed with arthroscopy 22 months after index surgery and revealed focal, pedunculated proliferation of synovial tissue with heavy pigmentation [13]. The patient's L-TGCT was arthroscopically resected at the time of diagnosis, and they progressed without issue until routine follow-up was discontinued. Several similarities exist between our presented case and the case described above: mechanical symptoms occurring at least 1 year after surgery with prolonged workup resulting in resolution of mechanical symptoms, and pain after resection occurring nearly 2 years after index TKA.

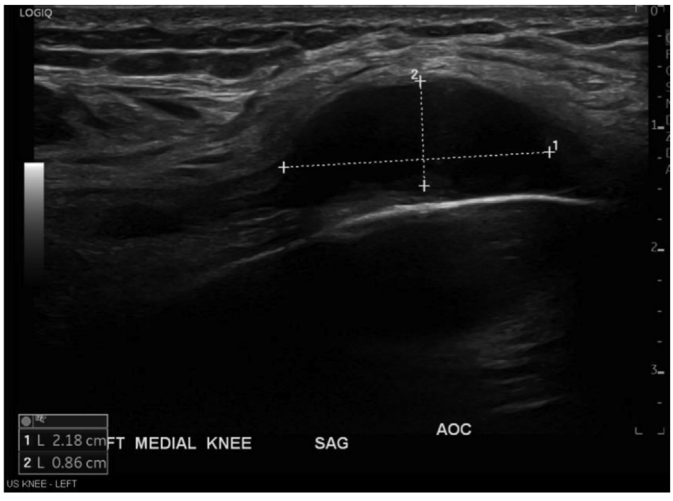

Figure 2. Ultrasound of mass prior to resection.

Several reports exist regarding preoperative or intraoperative diagnosis of TGCT during TKA.

In patients with known TGCT recalcitrant to open or arthroscopic synovectomy, TKA can help to alleviate pain and mechanical symptoms. Notably, the most common complication of TKA within this population is stiffness, which affects up to one-third of patients postoperatively [3,14]. In a series of 11 patients with incidentally discovered TGCT prior to TKA, the authors note that inactive disease was difficult to diagnose preoperatively [8]. MRI did not yield any preoperative signs of TGCT, thus limiting its utility. However, in this population, a combination of TKA and synovectomy in known or suspected TGCT has yielded a good prognosis without recurrence in long-term follow-up. Several authors recommend synovial resection when TGCT is known or suspected. Good prognosis has been reported in patients who were found to have TGCT incidentally during TKA and treated with synovectomy, while complication rates for TKA were found to be higher in patients diagnosed with TGCT prior to TKA [8,15]. It is unclear if these findings can be extrapolated to the prognosis of L-TGCT after TKA in particular, given the low incidence of this variant.

No mechanism of pathogenesis has been proposed explaining the development of TGCT (either L-TGCT or D-TGCT) after TKA. Important considerations regarding etiology include whether the formation of the mass is the result of the material used for prosthesis or the result of genetic abnormalities. It has been proposed that because synovectomy rarely occurs during TKA, TGCT proliferating in synovial tissue is independent of surgery [13]. Alternatively, trauma during the procedure could have precipitated the pathogenesis of this tumor [15]. This may or may not be associated with the time interval from TKA to TGCT diagnosis. While our patient presented with symptoms beginning 2 months postoperatively, no tumor growth was appreciated until 21 months postoperatively. Whether this was a fault of detection technique, low clinical suspicion, or tumor growth is unclear. Generally, L-TGCT is noted to be slow growing. We hypothesize that while he experienced symptoms early, detection may have been difficult as the tumor took time to reach appreciable size. This is consistent with reports that L-TGCT has a detection time of 10 months to 3 years in the context of known trauma for which an inciting event is noted [4]. Maintaining a higher index of suspicion may aid in the early diagnosis of this rare complication of TKA.

Low diagnostic index for TGCT may lead to delays in intervention as well as worsening of post-TKA complications. Consequently, we encourage consideration of this condition in the differential diagnosis and prompt intervention.

Summary

In this case report, we describe the development of L-TGCT after TKA. To date, this is only the second report of this rare finding complicating an otherwise routine TKA. While the cause is unclear, proposed mechanisms include synovial retention and microtrauma

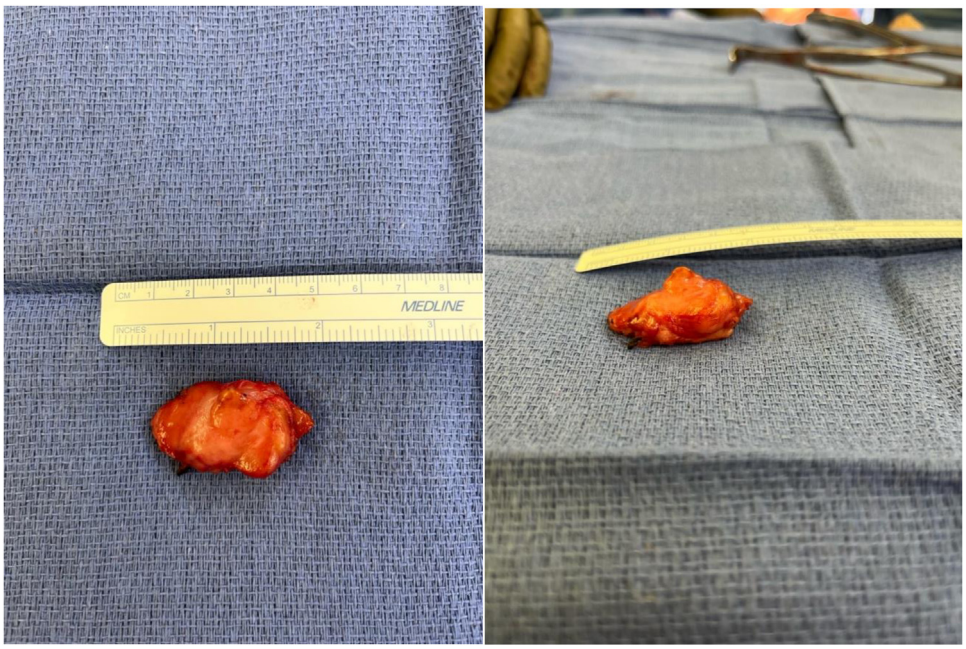

Figure 3. Clinical photographs after mass resection.

leading to delayed development of L-TGCT. Although postoperative outcomes are good, delayed recognition of this complication can lead to prolonged pain and disability.

Conflicts of interest

The authors declare there are no conflicts of interest.

For full disclosure statements refer to https://doi.org/10.1016/j.artd.2024.101438.

Informed patient consent

The authors confirm that written informed consent has been obtained from the involved patient(s) or if appropriate from the parent, guardian, power of attorney of the involved patient(s); and, they have given approval for this information to be published in this case report (series).

CRediT authorship contribution statement

Nicket Dedhia: Writing – review & editing, Writing – original draft, Supervision, Investigation. **Diego Zamata-Ovalle:** Writing – review & editing, Writing – original draft. **Emma Johnson:** Writing – review & editing, Writing – original draft, Investigation. **Evan Schwechter:** Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Investigation, Conceptualization.

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