



Case report

Concurrent Surgical Management of Advanced Osteoarthritis of the Knee and Proximal Tibiofibular Joint With Compressive Peroneal Neuropathy: 3-Year Follow-Up On a Complex Case

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ABSTRACT

The proximal tibiofibular joint (PTFJ) is susceptible to osteoarthritis (OA), making it a rare but potential source of lateral knee pain. Because PTFJ OA is a rare presentation of knee pain, no first-line treatment has been established and it can be missed in evaluation before total knee arthroplasty. We report an unusual case of a 59-year-old man who presented with advanced OA of both the knee and PTFJ, along with a progressive peroneal nerve palsy due to a large compressive ganglion cyst from the PTFJ. He was treated with concurrent total knee arthroplasty, peroneal nerve decompression, and resection of the fibular head and ganglion cyst, resulting in full recovery from his arthritic pain and resolution of his peroneal neuropathy. He remains free of symptoms without instability 3 years from the index surgery. © 2020 The Authors. Published by Elsevier Inc. on behalf of The American Association of Hip and Knee Surgeons. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Total knee arthroplasty (TKA) is a well-studied and highly successful treatment option for end-stage knee osteoarthritis (OA) with predictable outcomes [1]. In contrast, proximal tibiofibular joint (PTFJ) OA is a rare cause of lateral knee pain [2,3], and in severe cases that fail nonoperative management, the literature does not support any one specific surgical intervention. Case reports and small case series describe various surgical interventions for symptomatic OA of the PTFJ [4,5], but to the authors' knowledge, all of those interventions are performed as an isolated procedure separate from TKA.

In this report, we describe a 59-year-old male presenting with end-stage knee and PTFJ OA with peroneal nerve dysfunction due to a large ganglion cyst emanating from the degenerative PTFJ. He underwent simultaneous TKA and fibular head resection to successfully alleviate both his pain and nerve dysfunction. He remains asymptomatic 3 years from the index surgery. He was informed that his case would be submitted for publication and consented.

Case history

The patient presented in 2016 not only with typical symptoms of advanced medial compartment OA but also with atypical lateral-sided right knee pain and concomitant weakness and paresthesias in the distribution of the common peroneal nerve. He noted a small mass over the lateral side of his knee at the head of the fibula. There was no antecedent trauma or injury. His examination was notable for a mild varus deformity with medial joint line tenderness and crepitus through a range of motion (ROM) of his right knee. He was also tender to palpation over a palpable mass at the fibular head and had a positive Tinel's sign at that site. His examination was otherwise unremarkable. Plain radiographs revealed advanced OA and degenerative changes of the PTFJ (Fig. 1). Given the locality of his pain, neurologic symptoms, Tinel's sign, and the palpable mass, magnetic resonance imaging was performed, which documented degenerative disease of both the knee joint and PTFJ and a large ganglion cyst originating from the PTFJ and compressing the common peroneal nerve (Fig. 2). Further lumbar spine workup and peripheral nerve studies were deferred. After failing to improve with an appropriate trial of nonoperative treatment modalities, he was taken to the operating room for TKA and simultaneous cyst decompression and fibular head resection.

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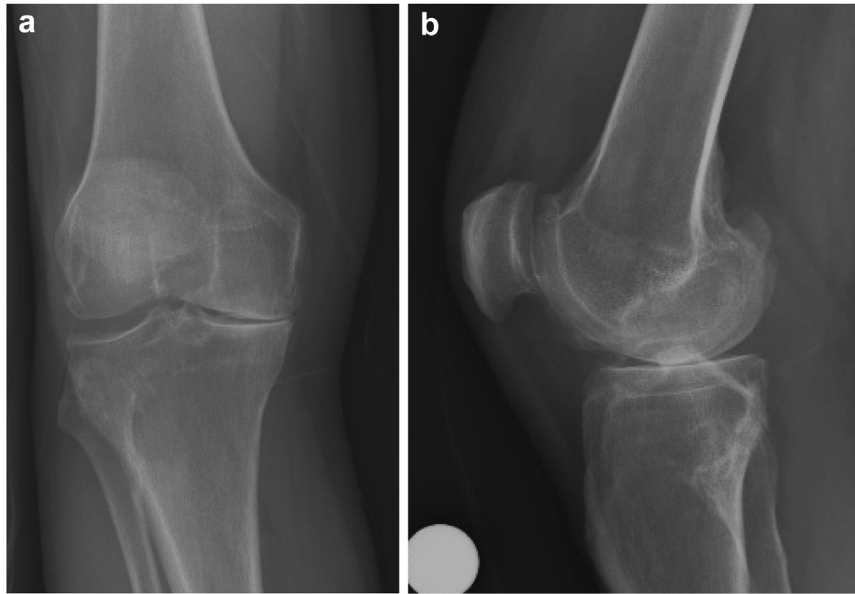


Figure 1. (a) Anteroposterior and (b) lateral plain radiographs of the right knee on presentation demonstrate advanced tricompartmental OA and sclerosis of the PTFJ.

He was placed supine on a standard operating room table, and a thigh tourniquet was inflated. The PTFJ cyst was first addressed using an S-shaped incision proximally along the biceps femoris tendon, curving obliquely across the path of the common peroneal nerve. The nerve was first identified at the proximal aspect of the incision and tagged. Next, the soft tissues were dissected around the fibular head, being careful to protect the nerve, and the tendon of the biceps and the lateral collateral ligament (LCL) were cut and tagged for future repair. Finally, 3 cm of the proximal fibula was resected using a sagittal saw, and the associated ganglion cyst was excised sharply.

After this, a standard anterior incision was made to perform the TKA, and a medial peripatellar arthrotomy was performed. These incisions were approximately 10 cm apart, and there was no concern for wound-healing issues. A cemented total knee prosthesis (Zimmer Biomet Persona, Warsaw, IN) posterior-stabilized implant was used with a constrained posterior-stabilized polyethylene liner and a short tibial stem extension. After final cementation of the components, attention was turned back to the previous lateral incision. The distal end of the LCL was captured with a #2 nonabsorbable suture in a Krackow fashion and affixed to

the proximal lateral tibia with a suture anchor. The tendon of the biceps femoris was directly repaired to its remnant. After repair, the knee demonstrated a full ROM and was stable to varus stress. The wounds were closed in a layered fashion, and he was made weight-bearing as tolerated with no ROM restrictions. Immediate postoperative radiographs are shown in [Figure 3](#).

He recovered well in the postoperative period and regained full sensory and motor function of the common peroneal nerve by his 12-week follow-up appointment. At the most recent follow-up, 3 years after his index surgery, his implants are intact and he has no signs or symptoms of instability, remains pain free at both the knee and ankle, and has no activity restrictions. Of note, in the interim, he underwent an endovascular stent of the right popliteal artery for symptomatic claudication, which is now visible in his radiographs ([Fig. 4](#)).

Discussion

This case report is a unique contribution to the literature, documenting durable 3-year results of concurrent TKA and fibular

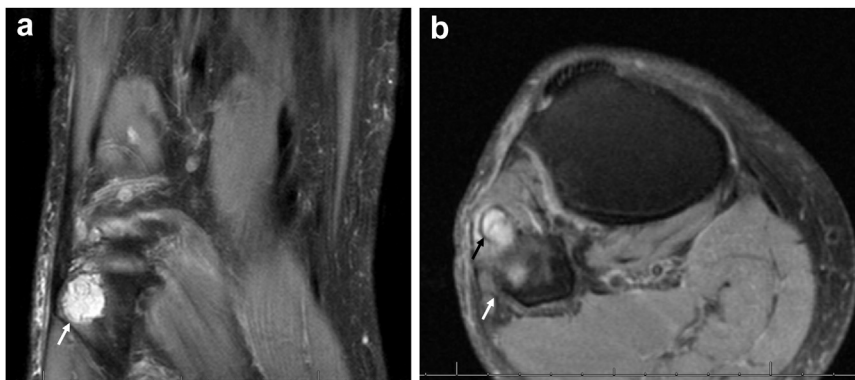


Figure 2. (a) T2 fat-saturated sequence coronal MRI demonstrating large cyst about the lateral side of the knee about the proximal tibio-fibular joint (white arrow). (b) T2 fat-saturated sequence axial MRI showing the large cyst and identifying the common peroneal nerve wrapping around the fibular head (white arrow) and being compressed by the cyst (black arrow) at that site. MRI, magnetic resonance imaging.

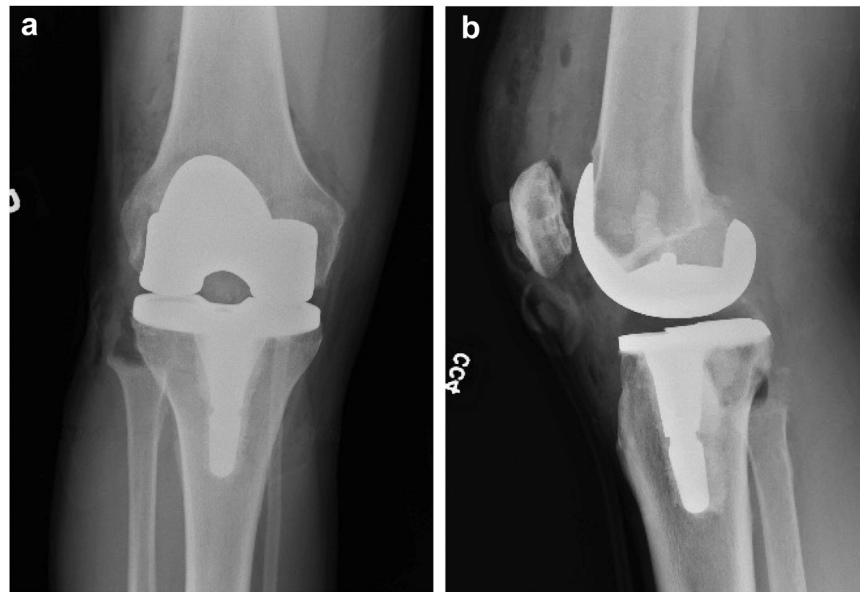


Figure 3. (a) Anteroposterior and (b) lateral plain radiographs of the knee immediately postoperatively.

head resection in a patient with advanced arthritis of both the tibiofemoral joint and the PTFJ. This approach simultaneously improved his osteoarthritic knee symptoms with knee arthroplasty, his lateral knee pain with resection of the arthritic PTFJ, and his peroneal nerve dysfunction with decompression of the nerve by removing the large ganglion cyst.

Several authors have described the PTFJ as the fourth compartment of the knee because of its anatomic communication with the synovial envelope of the femorotibial joint [6]. Ogden describes three basic functions of the PTFJ: (1) dissipating stress applied to the ankle, (2) dissipating stress from lateral tibial bending moments, and (3) tensile weight-bearing, suggesting that absence of the joint could result in instability of both the knee and ankle [7]. Furthermore, alignment of the PTFJ has been classified into two anatomic variants, which can be distinguished by the obliquity of the joint surface relative to the horizontal plane [7]: “horizontal” if less than or equal to 20° joint inclination and

“oblique” if greater than 20° of joint inclination, although intermediate varieties have been described as well [8,9]. This joint inclination influences the fibular rotation, which facilitates dorsiflexion and plantarflexion of the ankle [10]. The oblique joint inclination results in a smaller articular surface than the horizontal inclination, and Ogden reported a higher incidence of pathology such as subluxation and OA with the oblique inclination [7].

Although rare compared with pathology in the femorotibial or patellofemoral joint, the PTFJ can be a potentially overlooked source of pain or dysfunction around the lateral or posterior knee. Traumatic dislocation of the PTFJ is the most common pathologic condition associated with this joint; however, other conditions include subluxation, chronic instability, and degenerative OA [7,11–17]. Etiologies of degenerative joint disease of the PTFJ have not been elucidated, but it has been theorized that inflammatory enzymes passing through the communication of the knee’s joint spaces may contribute to the development of OA in both spaces

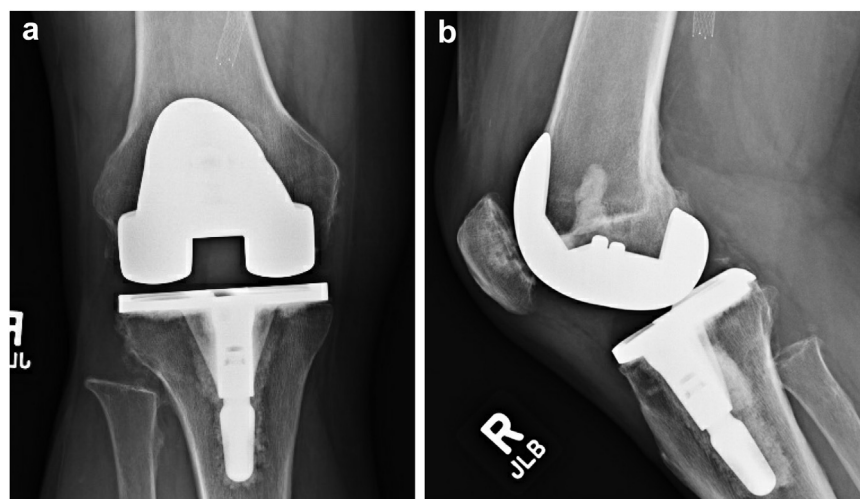


Figure 4. (a) Anteroposterior and (b) lateral plain radiographs of the knee at the most recent follow-up 3 years after the index procedure, showing a well-fixed total knee arthroplasty without signs of loosening, and the resected fibular head.

[16]. In a study of 40 patients with primary knee OA, Öztuna et al. found that the PTFJ has distinct radiographic signs of degenerative joint disease such as osteophyte formation and subchondral cysts [13]. Boya et al. assessed the PTFJ in 60 knees (34 patients) with primary knee OA and found the degree of OA in the PTFJ correlated with the degree of knee OA [18]. With these considerations in mind, the PTFJ should be considered in the differential diagnosis of lateral or posterior knee pain despite it being a relatively rare condition [5]. This consideration is especially important before performing TKA, as unresolved lateral knee pain may negatively influence postoperative outcomes [13].

Data on treatment of PTFJ disorders are limited. Wang and Hing reviewed nonoperative and operative treatments for PTFJ pathologies and concluded that when conservative treatment fails, either arthrodesis or resection was the most commonly used surgical option [17]. However, there is no consensus regarding when one treatment is preferred over the other. On the one hand, resection of the proximal fibula and its attachments (namely the LCL and the biceps femoris) may destabilize the knee joint itself. On the other hand, fusing the PTFJ proximally creates a potential for adverse ankle biomechanics and reduced limb function, as this tethers the fibula proximally and prevents its normal motion, and additionally may lead to problems with the hardware used for fixation. Kruckeberg et al. in a systemic review of PTFJ instability noted that both arthrodesis and fibular head resection had moderate rates of complications (28% and 20%, respectively). With arthrodesis, there is a risk for symptomatic hardware, deep infection, and arthrofibrosis of the knee [19]. Despite these risks, Nakama et al. reported good 2-year results of arthrodesis in a young patient with bilateral PTFJ OA [20]. They also suggest that resection could be used as a salvage procedure after a failed arthrodesis.

Data on PTFJ disorders in patients who require TKA are even more limited. To our knowledge, there is only one case report documenting surgical treatment of a PTFJ disorder in a patient who had previously undergone knee arthroplasty. Sundaram et al. reported satisfactory results of arthrodesis in an elderly patient with PTFJ OA 12 years after TKA, with relief of pain and return of function of the patient's knee at 6 months postoperatively. While fibular head resection was discussed as an alternative treatment by the authors, arthrodesis was chosen as their preferred treatment because of potential concerns for postoperative instability of the knee joint [5].

To our knowledge, this is the first report in the literature of a proximal fibular resection for PTFJ symptoms with a concomitant TKA. In the pooled analysis of prior case series of treatment for PTFJ instability by Kruckeberg et al, they identified four articles, totaling ten patients in the literature treated with proximal fibula resection. They noted good outcomes, with two (20%) complications: one patient who suffered a transient peroneal palsy and one with persistent lateral thigh pain [19].

One of the distinguishing features of our patient's presentation, compared with most of the existing reports of PTFJ dysfunction, was the large ganglion cyst originating from his PTFJ causing an obvious compressive neuropathy of his common peroneal nerve. Surgical options described for peroneal nerve compression at the level of the PTFJ include decompression, fibular head resection, and even nerve grafting in the setting of significant nerve damage where primary repair is not feasible [21]. Lateur et al. reported a series of seven patients who underwent surgical treatment for ganglion cysts of the PTFJ, three of which had concomitant peroneal neuropathy. Each was treated with resection of the cyst, either in isolation ($n = 4$) or in combination with arthrodesis ($n = 3$) of the PTFJ. There was one recurrence among the four patients who underwent simple cyst excision but none among the three patients who underwent simultaneous arthrodesis [22]. Similar findings

were reported in another series [23]. Other literature supports the use of fibular head resection for PTFJ cysts. Kapoor et al. showed in two cases that proximal fibula resection successfully treated PTFJ ganglion cysts that had recurred after decompression alone [24]. Miskovsky et al. showed that recurrence rates after primary excision are as high as 13% [23]. By resecting the joint itself, one has the advantage of eliminating the risk of recurrence, eliminating the pain generator of the arthritic joint, and in this case, allowing a more thorough decompression of the nerve after the bone has been removed. The concern with resection of the fibular head is the development of lateral joint laxity, which we mitigated by repair of the LCL and biceps femoris and the use of a constrained polyethylene liner.

Our patient's peroneal nerve was decompressed through excision of the large ganglion cyst originating from the degenerative PTFJ. We chose to resect the fibular head because of the severity of the underlying PTFJ OA and concern for recurrence of the ganglion cyst. We preferred fibular head resection over arthrodesis for this patient as it allowed better access to safely decompress the ganglion cyst and perform a complete peroneal neurolysis and additionally did not require additional hardware that may have interfered with the placement of the tibial component. Prior literature supports fibular head resection as a reasonable treatment option in patients with peroneal nerve palsy, persistent pain, subjective instability, or secondary OA who have failed nonoperative treatment [7]. It is important to note that resection and arthrodesis both carry inherent risks of worsening the peroneal neuropathy because of intraoperative trauma to the nerve itself [25]. In our patient, a careful dissection, neurolysis, and mobilization of the common peroneal nerve were performed before resection of the ganglion cyst and fibular head, which allowed the neurologic symptoms to resolve uneventfully with full functional recovery.

Another distinguishing feature of our case report was the durable stability of the primary knee prosthesis despite fibular head resection. Although the fibular head is the anatomic insertion of several lateral stabilizers of the knee joint, including the LCL and the biceps femoris, the lateral knee is also stabilized by the iliotibial band, the popliteus, and the lateral joint capsule, which remain intact after fibular head resection. In this patient's case, these remaining lateral structures were sufficient to provide excellent subjective lateral stability intraoperatively. Despite this excellent intraoperative balance, a constrained polyethylene liner was used to prevent the postoperative development of laxity of the remaining structures and to protect the repair in the short term as it healed. In a systematic review and meta-analysis of 30 publications and 3620 knees, Avino et al. found varus-valgus constrained TKA to provide good outcomes at medium term but potential for increased revision rates after 5 years [26]. Our patient continues to do well now 3 years from his procedure, and we will continue to be vigilant for any issues that arise in the future.

Summary

Concomitant knee OA, PTFJ OA, and peroneal neuropathy due to a compressive ganglion cyst are an unusual cause of knee pain. In this case, we describe the successful treatment of a patient with this constellation of symptoms with simultaneous TKA, proximal fibular head resection, and peroneal nerve decompression. We would encourage surgeons to be on the lookout for pain localizing over the PTFJ rather than the lateral joint line and consider further imaging workup with magnetic resonance imaging if there is a palpable mass, or concomitant neurologic symptoms, especially in the distribution of the common peroneal nerve. Given the durability of this patient's results at 3 years, we would consider this a useful approach in patients who present with similar symptoms.

Conflict of interests

C.L. Herndon is a board or committee member of the AAOS; H.J. Cooper receives royalties from Corin USA, is a member of the speakers' bureau for KCI, is a paid consultant for Corin USA, KCI Medical Canada, Inc, KCI USA, Inc, and Zimmer Biomet, receives research support from KCI, is a member of the editorial or governing board of the *JOA* and *JBJS*–America, and is a board or committee member of the AAOS; and T. Alonge and E. McDermott Nance declare no potential conflicts of interest.

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