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Arthroscopic Treatment of Popliteal Tendon Impingement Following Total Knee Arthroplasty: A Case Report

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Abstract

The popliteal tendon has been known to catch over a femoral osteophyte or the overhanging edge of the femoral component very occasionally following total knee arthroplasty (TKA). However, impingement of the popliteal tendon against the posterior edge of the tibial liner is rare. Although its pathological mechanism is simple, this complication cannot be definitively diagnosed unless posterior arthroscopic examination is performed. In this report, we describe the diagnostic and treatment challenges of using arthroscopy via posteromedial and posterolateral portals.

Keywords: TKA; Arthroscopy; Popliteal tendon; Impingement; Painful knee

Introduction

Total Knee Arthroplasty (TKA) is one of the most successful orthopedic procedures. It provides long-term good results in patients with arthritis. Unfortunately, a few patients complain of pain following TKA. This unusual complication, which is widely recognized as painful TKA, is caused by various pathologies (i.e., aseptic loosening, infection, component malposition, hypersensitivity to metal, problems of extensor mechanism, inadequate soft tissue balancing, arthrofibrosis, or soft tissue impingement) [1]. Among these, soft tissue impingement is difficult to diagnose based on conclusive evidence, because blood examinations are unspecific, and computed tomography or magnetic resonance imaging yields only unclear images with metal halation. Since the etiology of soft tissue impingement often remains unclear, accumulation of case reports is necessary for precise diagnosis and treatment.

Among cases of soft tissue impingement following TKA, impingement of the popliteal tendon is extremely rare. To our knowledge, only two case reports [2,3] have been quoted repeatedly in reviews [4], as well as in a technical note [5]. One report [3] described 2 cases that developed after TKA. Other reports [2,5] described 8 and 3 cases, respectively, that developed during TKA. In all these cases, the popliteus tendon impinged on the femoral side. However, we experienced a rare case of impingement of the popliteal tendon at the tibial side after TKA. This is necessary for distinguishing it from similar conditions, including a lateral synovial impingement [6] or a remnant meniscus [7]. In this report, we describe the diagnostic and treatment challenges of impingement of the popliteal tendon at the tibial side after TKA using arthroscopy via posteromedial and posterolateral portals.

Case Report

A 68-year-old woman visited our hospital because of persistent left knee pain for a year. Although the range of motion (ROM) of the left knee was comparatively maintained at 0° to 120° at the time of the initial consultation, she presented with a painful hydroarthrosis and a varus deformity. Radiography revealed osteoarthritis (Kellgren-Lawrence grade 4), and TKA was subsequently performed by using the Triathlon Posteriorly Stabilized Total Knee System (PS-Triathlon; Stryker, Mahwah, NJ). The operation was performed by using the standard technique and utilizing a medial parapatellar approach. The femoral prosthesis was aligned by using an intramedullary alignment. Following the distal femoral cut, the transepicondylar axis was marked and used as reference for correct femoral component rotation. The tibial prosthesis was aligned by using an extramedullary alignment. A central box cut was performed, and the posterior cruciate ligament (PCL) was removed. The patella was resurfaced. Prior to the insertion of the implants, flexion and extension gaps were measured by using spacer blocks in extension and 90° knee flexion, respectively. Although the flexion gap was greater than the extension gap by about 2-3 mm, with a slight lateral lift-off, we believe that this is permissible in this case. The patella was relocated to ensure proper tracking, and the arthrotomy was subsequently closed. Lastly, we intraoperatively confirmed that the patient gained full ROM without any abnormalities.

The postoperative course was unremarkable until 2 months after surgery. A ROM of 0° to 120° was attained by the second postoperative month, but she began to feel slight pain at the posterolateral aspect when the knee was bent at a maximum. Five months after the operation, the pain gradually increased in intensity, and finally, she screamed when the knee was bent at more than 100°. Neither swelling nor instability of the knee was observed. On blood examination, the leukocyte count was 6800/mm³ and the C-reactive protein level was 0.17 mg/dL. On radiographs, loosening was not observed. Concerning the alignment of the components, the α -, β -, γ -, and δ -angles were 98°, 90°, 10°, and 83°, respectively (Figure 1). Despite the conservative treatment for several more months, the pain progressed and the limitation of deep bending motion of the knee persisted. Therefore, we planned arthroscopic surgery at the eleventh postoperative month.

We did not find abnormal findings around the patellofemoral and femorotibial joints, as well as in the Posteriorly Stabilized (PS) box, through the standard anteromedial and anterolateral portals. The posteromedial portal was then created in order to examine the posterior pathology, and the popliteal tendon was found to be impinged against the posterior edge of the tibial liner at around 90°. The mid-substance of the tendon lacked a tenosynovial membrane and was partially lacerated. From beyond 90°, the surface of the more tensed tendon had been scraped against the sharp edge (Figure 2, Video 1). We speculate that this phenomenon caused the patients discomfort, and then the

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Figure 1: Radiographs demonstrating the absence of loosening. The α -, β -, γ -, and δ -angles were 98°, 90°, 10°, and 83°, respectively. a. A-P view. b. R-L view, c. Skyline view.



Figure 2: Arthroscopic views through the posteromedial portal. The popliteal tendon impinges against the posterior edge of the tibial liner at around 90°. White arrows indicate the scraped mid-substance of the tendon. F: Femoral component. T: Tibial liner. P: Popliteal tendon.

posterolateral portal was created. Under posteromedial visualization, the popliteal tendon was curetted by using standard punches and the arthroscopic shaver, and transpired by using the VAPR probe (Mitek Corp.) through the posterolateral portal. After resection of the popliteal tendon, no impingement was found throughout the full ROM. After the first postoperative day, the pain completely disappeared and the active ROM was 0° to 140° without pain. At 4 years after arthroscopic surgery, no recurrence was subsequently observed.

Discussion

The popliteal tendon catches over a retained lateral femoral condylar osteophyte or the overhanging edge of the metallic posterior femoral

condyle. Patients usually complain of painful snapping or a catching sensation on knee flexion and extension. In a series involving 300 TKAs, Barnes et al. [2] released the tendon from its femoral insertion during surgery (8 cases). The skilled surgeon subsequently removed the osteophytes completely after careful selection of an appropriate component size and ensured that the popliteal tendon did not interrupt the smooth flexion of the knee after capsular closure. In the event of snapping, the popliteal tendon was released before completing the surgery. Kazakin et al. [5] used this method in 3 cases that required popliteal tendon release during TKA, among 1,000 consecutive cruciateretaining TKAs. Allardyce et al. [3] presented the first two postsurgical cases of snapping popliteal tendons, among approximately 1000 TKAs that did not demonstrate this phenomenon intraoperatively. Although the cause of the late onset was not clear, the symptoms resolved rapidly after arthroscopic release of the tendon in both patients. They concluded that the postoperative incidence of this condition was lower than its intraoperative incidence. Although popliteal tendon impingement with painful snapping at the femoral side after TKA was a rare occurrence, this has been repeatedly recognized in other reviews [4].

Our case differed from popliteal tendon impingement with painful snapping at the femoral side in several aspects. Our patient never complained of a snapping or catching sensation intraoperatively, during the follow-up period, or at arthroscopy. The only symptom reported was pain at knee flexion beyond 90°, which started at the second postoperative month and gradually intensified and elicited screams from the patient by the fifth postoperative month. The tendon was impinged against the posterior edge of the tibial liner at around 90°. Beyond 90°, the surface of the tensed tendon started scraping against the sharp edge. This phenomenon might have been overlooked if we only used the standard anterior portals. It was first detected via posterior septum during the first operation for PS-TKA made it possible to observe almost the entire posterior compartment on posterior arthroscopy, when extending the knee ROM from approximately 45° to 110°.

Slight malposition of the tibial component might have been one of the causes. It might have been set in a slightly excessive external rotation. A fundamental solution would have been to revise the tibial component. However, we chose excision of the popliteal tendon because a revision would have been too invasive. The popliteal tendon is a component of the stabilizing structures of the posterolateral knee and has been reported to have both static and dynamic functions, with respect to knee stability in the native knee [8]. However, the precise role of the popliteal tendon in knee stability after total knee arthroplasty is much less apparent. Kesman et al. [9] previously reported no



differences in the subjective balance of the knee after intentional sectioning of the popliteal tendon during TKA. They also speculated that the popliteus might not have the same critical functions after TKA because of the combination of increased constraint in the TKA relative to the native knee and the relatively lower functional demand in this patient population. In addition, a recent experimental study [10] using the current constrained design of the PS knee replacement (PS-Triathlon) revealed that isolated sectioning of the popliteal tendon did not substantially generate abnormal knee laxity to 90° during knee flexion. PS prostheses may prevent some rare TKA complications, such as luxation [11], by withstanding the more stress at the PS post. By using the PS-Triathlon as previously described [10], sectioning of the popliteal tendon in our study produced excellent results and did not generate adverse effects over 3 postoperative years.

However, we kept in mind that the patient achieved 140° of the knee flexion just as the popliteal tendon was sectioned. Paradoxically, we expected the popliteal tendon to be tense beyond 90° of the knee flexion. In addition, Simone et al. [12] reported that intraoperative complete sectioning of the popliteal tendon during TKA results in decreased International Knee Score for function after 2 to 3 postoperative years. These facts warrant the necessity for further investigation and longterm follow-up of our case.

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