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CASE REPORT

Tendon Traction Point Therapy for Medial Knee Pain in an Elite Badminton Player: A Case Report

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Abstract: Medial knee pain in elite athletes is often attributed to structural lesions such as medial meniscus tears; however, imaging findings do not always correspond to the primary pain generator. We report a 20-year-old elite badminton player diagnosed with a partial tear of the medial meniscus posterior horn (MMPH) who presented with severe medial knee pain and was initially recommended for surgical treatment. Detailed clinical evaluation suggested that the patient's symptoms were more consistent with pes anserinus-related pathology involving the sartorius, gracilis, and semitendinosus (SGS) tendon complex. Under ultrasound guidance, four weekly injections of 5 mL 5% dextrose were administered into the tendon traction points (TTP) of the sartorius, gracilis, and semitendinosus muscles. Pain scores markedly improved from 8 to 1 on the Visual Analog Scale (VAS), with rapid recovery of function and full return to competition without surgical intervention. At two-month follow-up, the athlete reported minimal residual discomfort without any functional limitations. This case highlights the importance of identifying the true pain generator in medical knee pain and demonstrates that TTP injection therapy is a safe, steroid-free, and minimally invasive non-surgical alternative, particularly in athletes where rapid return to play is critical.

Keywords: knee pain, medial meniscus posterior horn, badminton, tendon traction point injection

Introduction

Badminton is a high-intensity sport characterized by rapid directional changes, jumping, and landing, movements that impose repetitive and concentrated stress on the lower extremity joints.[1] Among these joints, the knee plays a central role in absorbing impact and facilitating dynamic rotational movements. Medial knee pain in athletes is commonly attributed to structural abnormalities such as medial meniscus posterior horn (MMPH) tears, which are frequently identified on magnetic resonance imaging (MRI).[1,2] However, several studies have suggested that imaging findings do not always correlate with clinical symptoms, and pain may instead arise from surrounding soft tissue structures, including the pes anserinus complex.[3–5]

In clinical practice, patients diagnosed with meniscal injury are often recommended for arthroscopic surgery.[6] However, in elite athletes, surgical intervention carries several drawbacks, including extended rehabilitation, temporary loss of athletic performance, and potential disruption of professional careers.[7–9] When competition is imminent, many athletes are reluctant to undergo surgery, emphasizing the urgent need for non-operative strategies that facilitate rapid and effective recovery. However, current non-surgical treatments, such as rest, physical therapy, nonsteroidal anti-inflammatory interventions, and intra-articular injections, may provide only temporary symptom relief and may not adequately address underlying neuromuscular or tendon-related dysfunction. In addition, some approaches may delay

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return to play or carry potential adverse effects, highlighting the need for alternative strategies that enable rapid and function-oriented recovery in elite athletes.

Tendon Traction Point (TTP) injection therapy has recently emerged as a novel, minimally invasive, steroid-free approach that directly targets muscular and tendinous dysfunction, rather than focusing solely on inflammation.[10–12] Although clinical evidence is still emerging, previous case reports and pilot studies have demonstrated its potential effectiveness, including sports-related tendon injuries and chronic myofascial pain syndromes.[10–12] This technique involves identifying tender points near the tendon insertions in the symptomatic region and injecting non-steroidal agents, such as dextrose, into the central portion of the associated muscle belly. By alleviating excessive muscle-tendon tension and reducing peripheral sensitization, TTP therapy improves pain and function through neuromyofascial relaxation mechanisms. Compared to intra-articular steroid injections, which provide only short-term symptom relief and carry the risk of doping violations, TTP offers sustained therapeutic benefits without compromising athletic eligibility.[10]

In this report, we present a case of a 20-year-old elite female badminton player diagnosed with a partial tear of the MMPH in whom the primary source of pain was determined to be the pes anserinus region rather than the meniscal lesion itself. The patient achieved rapid symptom resolution following TTP injection therapy targeting the sartorius, gracilis, and semitendinosus muscle-tendon complex, without surgical intervention. The clinical approach described in this case highlights the therapeutic potential of TTP as a practical, safe, and effective alternative for managing musculoskeletal injuries in competitive athletes.

This study was conducted with written informed consent from the patient. Exemption from the Institutional Review Board (IRB) was granted by the Ministry of Health and Welfare of the Republic of Korea (Approval No. P01-202506-01-026).

Case Presentation

A 20-year-old elite female badminton player presented with acute medial left knee pain. The symptoms had begun suddenly during regular training two weeks prior to visit, initially manifesting as severe pain during stair ambulation and progressively worsening to the point of impairing daily walking. On initial assessment, her pain intensity was rated 8 out of 10 on the Visual Analogue Scale (VAS), with continuous tenderness at rest and aggravation during movement, rendering her unable to perform any athletic activity.

Initial musculoskeletal ultrasonography performed at an outside clinic revealed findings suggestive of inflammation localized to the pes anserinus region of the medial knee, consistent with pes anserine bursitis and associated tenosynovitis, rather than intra-articular synovitis of the knee joint. In contrast, magnetic resonance imaging (MRI) further demonstrated a partial tear of the MMPH (Figure 1), without direct involvement of the pes anserinus region. Although arthroscopic surgery was recommended, the patient strongly declined surgical intervention due to an upcoming national competition in one month and concerns regarding postoperative recovery. She also expressed a strong preference for a steroid-free, doping-safe therapeutic approach.

On physical examination, focal tenderness was localized over the pes anserinus, whereas no tenderness was noted along the medial joint line. The McMurray test was negative, and the overall clinical findings that the patient's symptoms were more likely related to the pes anserinus region than to the meniscal lesion. Functionally, the patient experienced pain during forward lunges, squats, and single-leg landing tasks, key movements required in badminton sport, which she was unable to perform properly.

Given these findings, a non-surgical treatment approach using TTP injections was selected. A 5 mL injection of 5% dextrose solution was administered under ultrasound guidance, targeting the most tender regions of the sartorius, gracilis, and semitendinosus (SGS) muscles (Figure 2). Injections were performed at five-day intervals, for a total of four sessions. Pain intensity was evaluated using the VAS prior to each session, with a final evaluation conducted three months after the initial injection.

After the first injection, VAS pain score improved from 8 to 3. Following completion of the fourth treatment, the VAS score further decreased to 1, allowing the patient to resume full training (Figure 3). She subsequently participated in a national mixed doubles badminton competition, where she achieved first place without any pain or functional limitations. At two-month follow-up, her VAS score remained at 1, with minimal discomfort reported during stair climbing or jumping activities.

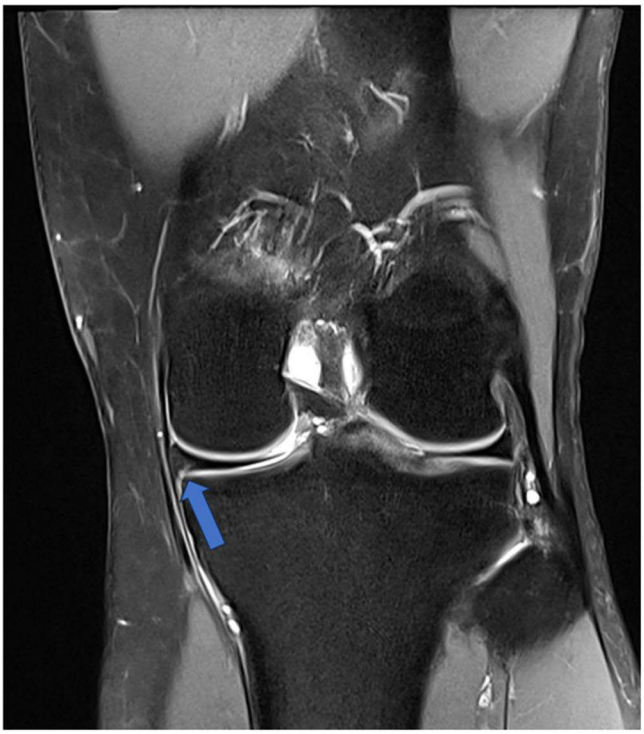

Figure 1 Coronal T2-weighted fat-suppressed magnetic resonance imaging (MRI) of the left knee. The blue arrow indicates a hyperintense linear signal at the posterior horn of the medial meniscus, consistent with a partial tear. The medial meniscus appears irregular in contour, suggesting degenerative changes and fiber disruption without complete detachment. Surrounding soft tissue structures, including the pes anserinus region, show no direct involvement on this slice.

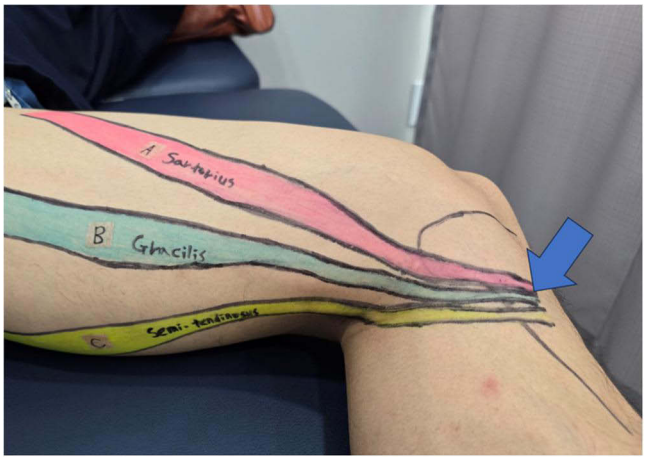

Figure 2 Anatomical illustration of the pes anserinus region on the medial aspect of the knee. The sartorius (A, red), gracilis (B, blue-green), and semitendinosus (C, yellow) tendons are individually identified with color-coded markings. The blue arrow indicates the pes anserinus on the anteromedial tibia, corresponding to the region of localized tenderness reported by the patient. Based on this focal tenderness, the associated tendons were identified and traced proximally to their respective muscle bellies. TTP (Tendon Traction Point) injection therapy was subsequently performed by administering 5 mL of 5% dextrose into each muscle, targeting the most tender myofascial regions to relieve excessive tension and referred pain.

Although she reported approximately 10% residual discomfort during intense training, it did not interfere with her daily activities or athletic performance. Clinically, her functional stability and load-bearing capacity of the knee were preserved.

Discussion

This case report demonstrates the successful non-surgical management of medial knee pain in an elite badminton player, in which the primary pain generator was determined to be pes anserinus-related tendinopathy rather than the coexisting

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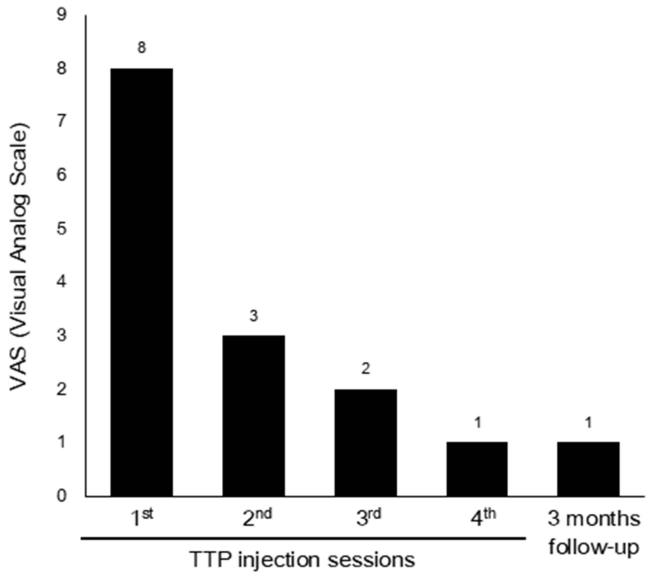

Figure 3 Trend in Visual Analog Scale (VAS) scores over the course of four Tendon Traction Point (TTP) injection sessions. The patient's initial VAS score was 8 prior to the first injection. After the first session, pain decreased to a VAS score of 3, followed by scores of 2, 1, and 1 in subsequent sessions. The graph illustrates a rapid and sustained reduction in pain intensity across the treatment period.

MMPH tear identified on MRI. The patient's rapid clinical improvement following targeted extra-articular TTP injection therapy supports the importance of identifying the true source of pain beyond structural imaging findings. Based on this case, three key clinical insights emerged regarding the mechanism of action, diagnostic implications, and broader applicability of the TTP therapy.

First, TTP therapy is physiologically distinct from intra-articular corticosteroid injections. While corticosteroids primarily mitigate joint inflammation by suppressing pro-inflammatory cytokines, their repeated use carries risks including cartilage degeneration, tendon weakening, systemic complications, and doping-related concerns in athletes.[7–9,13] In contrast, TTP therapy directly modulates neuromyofascial dysfunction by targeting regions of excessive muscle-tendon tension and fascial irritation.[10–12] Injection of non-steroidal agents, such as isotonic saline or dextrose, into muscle tender points helps modulate peripheral sensitization, improves local microcirculation, and alleviate traction stress at tendon insertion sites.[10] This shifts the therapeutic paradigm from inflammation suppression to neuromuscular rebalancing, offering a safer and more sustainable approach for athletic populations.

Second, although MRI revealed a partial tear of the MMPH, the clinical features were more consistent with irritation of the pes anserinus complex, specifically the sartorius, gracilis, and semitendinosus tendons.[3–5] Her immediate clinical response to TTP injection, without any direct intervention to the meniscus, raises a crucial diagnostic consideration: imaging findings do not always correlate with clinical symptoms. Overreliance on pain in an MRI finding may result in unnecessary surgeries. In this context, TTP therapy may serve not only as an effective treatment but also as a diagnostic tool to help identify functional sources of pain rather than structural sources of pain.

Third, the pathophysiological concept of TTP, originally described by Seong et al, involves excessive friction or compression between hypertonic tendons and surrounding anatomical structures such as the periosteum, retinaculum, bursae, and tendon sheaths.[10] These repetitive interactions induce localized inflammation and nociceptor sensitization, particularly in athletes exposed to high mechanical loading. Recognizing these tendon-overuse syndromes as functional pain generators is critical in distinguishing them from structural pathology. TTP-based interventions may reduce the unnecessary surgeries and facilitate safe return to play.

The injection protocol developed by the "Tong-sa" Research Group emphasizes the mechanical correction of musculoskeletal dysfunctions, rather than the pharmacological suppression of inflammation.[10,14] This approach involves administering isotonic saline or 5% dextrose to anatomically defined TTPs and nerve entrapment points (NEPs) to alleviate excessive muscle tissue tension and restore neuromuscular balance.[10] TTP therapy has demonstrated clinical

utility in various cases including ulnar-sided wrist pain initially misdiagnosed as triangular fibrocartilage complex (TFCC) injury, and acute dorsal wrist pain in weightlifters.[11,12] NEP-guided injections have also shown effectiveness in managing laryngopharyngeal reflux, plantar fasciitis, chronic migraine, cluster headache, nausea and vomiting during pregnancy, as well as more recently, posterior neck pain.[15–20] Collectively, these outcomes support the broader adoption of functionally focused, non-structural pain management strategies.

In the present case, four sessions of ultrasound-guided TTP injections in rapid and sustained pain relief (VAS 8 to 1), restoration of sport-specific functional tasks, and successful participation in a national-level competition. The clinical effects were maintained at three-month follow-up, with no functional decline or reinjury. Importantly, the therapy was steroid-free, aligning with doping-safety requirements in elite sports.

Limitations of this case include the single-patient design, short follow-up period, and lack of standardized functional outcome measures beyond VAS. Nevertheless, the reproducible treatment protocol and rapid clinical effect provide preliminary evidence for TTP as a novel, non-surgical therapeutic option in sports medicine.

In conclusion, this case demonstrates that medial knee pain in athletes may arise from pes anserinus-related tendinopathy rather than structural lesions such as meniscal tears, even when such abnormalities are identified on imaging. Targeted extra-articular TTP injection therapy effectively relieved pain, improved function, and enabled rapid return to sport without surgical intervention. By addressing underlying neuromuscular and fascial dysfunction rather than structural abnormalities alone, TTP may broaden the therapeutic spectrum of sports medicine. Further controlled trials and larger cohort studies are warranted to validate its clinical efficacy and optimize treatment protocols.

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Disclosure

The authors report no conflicts of interest in this work.

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