

## A Tendinopathy of the Distal Quadriceps Femoris in a Professional Pitcher Treated with a Neutrophil-Reduced Platelet-Rich Plasma: A Case Report

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### Abstract

An enthesopathy developed at the distal quadriceps femoris in a professional pitcher was quite rare. We treated the enthesopathy unrecovered with a preceding 3 months conservative therapy by using a neutrophil-reduced platelet-rich plasma (PRP). The patient was 27 years old, a right overhand pitcher. The pain occurred in his left knee during the acceleration phase of pitching motion. A Power Doppler analysis showed an abnormal hypervascularity area and the magnetic resonance (MR) revealed an enthesopathy with a partial tear at the distal insertion site of the quadriceps femoris tendon. The PRP therapy was performed twice separated by a three weeks interval. Concentrations of platelets or neutrophils in PRP were adjusted to be optimal for the treatment of the tendinopathy. He returned to his previous sport activity level at 11 weeks without symptoms. The hypervascularity region disappeared on Power Doppler images and the partial tear observed on MR scans also receded. A rare quadriceps femoris tendinopathy in baseball pitcher was recovered with a therapy using PRP containing optimal concentrations of platelets or neutrophils.

**Keywords:** Tendinopathy; Platelet-Rich Plasma; Baseball Pitcher; Quadriceps Femoris Tendon

### Introduction

Achilles or elbow tendinopathies are often observed in athletes; however, tendinopathy at the distal insertion site of the quadriceps femoris tendon is rare especially in baseball pitchers since it was hard to find any reports describing the enthesopathy of the distal quadriceps femoris in baseball [3]. For the treatment of the enthesopathy an autologous platelet-rich plasma (PRP) therapy was generally applied when the preceding conservative therapy had been ineffective. Therefore, we treated the quadriceps femoris tendinopathy in a professional baseball pitcher, who resisted a preceding 3 months conservative therapy, by using a PRP therapy. We adjusted concentrations of platelets or neutrophils in PRP in order to obtain the maximum reparative effect for the tendinopathy when we prepared solutions of PRP [2,4,5].

### Case Report

An informed consent was obtained from the patient for the use of his personal medical records. The patient was a 27-year-old male, right overhand, professional starting pitcher. He had developed pain during the acceleration phase of throwing motion at the distal insertion site of the quadriceps femoris tendon on the left side in the midseason and the pain worsened gradually during consecutive games. Then, he underwent an injection of the combination with 0.3 mL of 3.3 mg/mL corticosteroid and 3.0 mL of 1.0% mepivacaine at the distal insertional site of the quadriceps femoris tendon for one time and he kept the rotation of the starting pitcher until the end of the regular season. After finishing the regular season, he stopped pitching and underwent a conservative treatment that included rest, activity modification, use of anti-inflammatory agents

and physical therapy for 3 months. Notwithstanding the treatment, his symptoms and physical signs did not improve and he presented at our hospital. On the initial physical examination, tenderness at the distal end of the quadriceps femoris tendon was observed and the pain was induced on resistance against active extension movement of the left knee joint. The range of motion (ROM) during internal rotation (IR) in his left hip joint was reduced both in extension and flexion. A Power Doppler analysis showed an abnormal hypervascularity area at the distal insertion site of the quadriceps femoris tendon and magnetic resonance (MR) scans taken in short tau inversion recovery (STIR) mode showed a high intensity of the distal quadriceps femoris tendon accompanied with a partial tear at its distal insertion site (Figure 1).

was classified as type 3 according to the Mishra's classification and as "pure" with the PAW classification since its activation was not performed before injections.

The PRP was slowly and gently injected into or near the distal insertion site of the quadriceps femoris tendon with a 27 G needle under ultrasonography guidance with the patient in prone position. No anesthesia was applied for the procedure and the surface of the skin was sterilized with a 10% povidone-iodine solution before injection. Following injection, the patient's knee was bandaged under non-weight bearing condition for 1 week. Then, he was allowed to walk with the total weight bearing possible during daily living activities. A physical therapy was simultaneously introduced to release the ROM restriction on IR in his left hip joint. The second PRP injection was performed 3 weeks following the first one.

Pain on motion, tenderness and stress pain improved and the abnormal hypervascularity area disappeared 5 weeks after the first PRP injection. He began jogging or exercising his left knee and then started interval throwing 6 weeks after the first injection. He returned to pitching activity levels as before the onset of pain or ROM restrictions in his left knee or hip joints at 11 weeks after the first injection. MRI showed receding of the partial tear at the distal insertion site of the quadriceps femoris tendon, although signal intensities in this region were moderately high (Figure 2).

**Figure 1:** a) A Power Doppler image taken in the sagittal plane of the region above the left patella. An abnormal hypervascularity area was observed at the distal site of the quadriceps femoris tendon. A right side was proximal. b) A magnetic resonance (MR) image taken in the short tau inversion recovery (STIR) mode of the left knee, the sagittal section. A clear-margin high intensity area at the distal site of the quadriceps femoris tendon (white arrow) with a high intensity signal around it compared to that of the tendon were observed indicating that tendinopathy was accompanied by a partial tear at the distal site of the quadriceps femoris tendon. A right side was proximal.

**Figure 1:** a) A Power Doppler image taken in sagittal plane of the region above the left patella. The abnormal hypervascularity area disappeared after two PRP injections. A right side was proximal. b) A magnetic resonance (MR) taken in the short tau inversion recovery (STIR) mode in the sagittal plane of the left knee. The clear-margin high intensity area disappeared after two PRP treatments, although signal intensities at the distal site of the quadriceps femoris were moderately high. A right side was proximal.

The PRP therapy was performed twice with the 3 weeks interval. A 6.4 mL of an autologous neutrophil-reduced PRP sample was obtained from 44 mL of the whole blood with a preparation kit (MyCells, Kaylight, Tel Aviv, Israel), accordingly with the manufacturer's instructions [4,5]. In the PRP sample, the concentration of platelets or leucocytes was  $8.7 \times 10^5/\mu\text{L}$  and  $3.0 \times 10^3$  cells/ $\mu\text{L}$  (no neutrophils), respectively, and no erythrocytes were present. Neutrophils were excluded by the separation gel of the spit. The PRP

## Discussion

Shoulder or elbow disorders have been often observed in baseball pitchers and those affecting the quadriceps femoris tendon have been usually found in football players [3]. Reports on quadriceps femoris tendinopathy at the distal insertion site of the tendon developed in baseball pitchers are difficult to find or are inexistent in the literature [3].

In the presented case, we proposed that the excessive mechanical stress repetitively affecting the distal insertion site of the quadriceps femoris tendon of the left knee during the pitching had led to development of the tendinopathy. The stress on the distal aspect of the tendon could have most probably accumulated during the acceleration phase of the throwing motion in this right-handed pitcher, in whom the hip joint ROM restriction on IR motion could have further contributed to the pathology. The hip joint ROM restriction would have repeatedly disturbed the normal kinetic chain of throwing motion and produced an over excessive stress on the distal quadriceps tendon [1].

It has been well-known that PRP therapy is an effective and safe method of tendinopathy treatment as proved by basic and clinical sport medicine studies, although some limitations have been indicated [2,4,5]. A major problem in a PRP therapy is that the concentration of platelets or leukocytes in PRP cannot be controlled to be optimal for the treatment of the tendinopathy when the PRP is prepared by using the majority of commercially released preparation kits. There is an optimal concentration of platelets or neutrophils to demonstrate the maximum efficacy of PRP therapies against tendinopathy, which was detected in the cultured cell studies *in vitro* or in the animal model study *in vivo* [2,4,5]. An optimal concentration of platelets is in the range of  $7.0 \times 10^5 \sim 10.0 \times 10^5/\mu\text{L}$  and an optimal condition of leukocytes is no neutrophils in PRP [2-4]. A reparative efficacy of a PRP, which contained platelets or leukocytes at the non-optimal concentration, is inferior compared to that at the concentration optimal for the treatment of the tendinopathy. We can adjust the concentrations of platelets to be in the range optimal for the treatment of the tendinopathy by modulating the ratio of the concentration, which is performed by adjusting the volume of the supernatant plasma excluded from the preparation spit of "MyCell" after measuring the concentrations of platelets in PRP. It is essential for the successful treatment of the tendinopathy to adjust concentrations of platelets or neutrophils as optimal.

## Conclusion

The tendinopathy of the distal quadriceps femoris complicated by a partial tear was successfully treated with twice injections of PRP containing optimal concentrations of platelets or neutrophils for the treatment of the tendinopathy allowing the patient to return to previous sport activity levels of a professional baseball pitcher.

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## Declaration of Conflict of Interest

I declare that I have no conflicts of interest in the authorship or publication of this contribution.

## Bibliography

1. Chalmers PN, *et al.* "The relationship between pitching mechanics and injury: a review of current concepts". *Sports Health* 9.3 (2017): 216-221.
2. Kia C., *et al.* "Platelet-rich plasma: review of current literature on its use for tendon and ligament pathology". *Current Reviews in Musculoskeletal Medicine* 11.4 (2018): 566-572.
3. Pesquer L., *et al.* "Imaging of quadriceps femoris proximal tendinopathies". *Skeletal Radiology* 45.7 (2016): 889-897.
4. Yoshida M., *et al.* "Efficacy of autologous leukocyte-reduced platelet-rich plasma therapy for patellar tendinopathy in a rat treadmill model". *Muscle, Ligaments and Tendons Journal* 6.2 (2016): 205-215.
5. Yoshida M and Marumo K. "An autologous leukocyte-reduced platelet-rich plasma therapy for chronic injury of the medial collateral ligament in knee: A report of three successful cases". *Clinical Journal of Sport Medicine* 29.1 (2019): e4-e6.

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