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Case Presentation

Treatment of Patellar Tendinopathy Refractory to Surgical Management Using Percutaneous Ultrasonic Tenotomy and Platelet-Rich Plasma Injection: A Case Presentation

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Abstract

Chronic proximal patellar tendinopathy is a common condition in sports medicine that may be refractory to nonoperative treatments, including activity modification, medications, and comprehensive rehabilitation. Percutaneous ultrasonic tenotomy is a recently developed technique designed to cut and debride tendinopathic tissue, thus promoting pain relief and functional recovery. We present a case of a collegiate athlete with chronic proximal patellar tendinopathy who was effectively treated with percutaneous ultrasonic tenotomy after not responding to extensive nonoperative treatment, surgical debridement, and platelet-rich plasma injections. Percutaneous ultrasonic tenotomy can be considered as a treatment option in patients presenting with refractory proximal patellar tendinopathy, including those who do not respond to previous operative intervention.

Introduction

Chronic patellar tendinopathy is a common condition among athletes and clinically manifests as pain, tenderness, and variable swelling in the patellar tendon, generally at its proximal aspect. Proximal patellar tendinopathy affects up to 40% of professional athletes, particularly those involved in jumping sports [1]. It is generally accepted that patellar tendinopathy is a chronic degenerative condition of the tendon. In some individuals, these chronic stresses overwhelm the natural healing response, resulting in focal degenerative changes histologically characterized by disorganized collagen, increased ground substance, hypercellularity, and hypervascularity (ie, neovascularization) [2,3]. Severe cases can be accompanied by collagen fiber disruption, resulting in partial tears.

A detailed history and physical examination usually are used in making the diagnosis of patellar tendinopathy. When clinically indicated, soft-tissue imaging modalities such as magnetic resonance imaging and ultrasonography (US) can identify the characteristic structural changes within the proximal patellar tendon and facilitate the exclusion of alternative diagnoses. On US, the affected proximal portion of the patellar tendon typically is enlarged, hypoechoic (ie, darker than normal), heterogeneous, and exhibits variable neovascularization on Doppler examination. Focal regions of hypoechogenicity devoid of collagen bundles, may be seen and represent partial-thickness tearing. Cortical irregularities affecting the inferior patellar pole and/or intratendinous calcifications may be seen in chronic cases [4].

Most patients affected by patellar tendinopathy respond to rest, activity modification, nitroglycerin patches, and eccentric exercises; however, approximately 10% of cases will become refractory [5]. In these situations, a variety of treatments have been attempted to promote a healing response in the setting of what is now understood to be a chronic, degenerative, "underhealed" histologic state [1]. Such treatments include tendon fenestration (ie, dry needling), injection of autologous blood, neovessel ablation [5], corticosteroid injection, high-volume paratenon injections [3,5], and the injection of platelet-rich plasma (PRP) [6]. When these interventions fail, open or endoscopic surgical debridement represents a definitive treatment option with success rates varying from 45% to 100% [1].

Unfortunately, in the small subgroup of patients in whom surgery also is unsuccessful, therapeutic options

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are limited. We present a case of chronic, proximal patellar tendinopathy refractory to traditional nonoperative interventions, regenerative injections, and surgical debridement in which the patient was treated successfully with percutaneous ultrasonic tenotomy combined with a single additional PRP injection. Although percutaneous ultrasonic tenotomy has been used successfully to treat refractory elbow and patellar tendinopathy, the current case represents the first published report of percutaneous ultrasonic tenotomy in the setting of previous surgical failure [7-9].

Case Presentation

A 21-year-old male collegiate sophomore basketball player presented with a 6-year history of right proximal patellar tendinopathy refractory to ice, supervised activity modification, anti-inflammatory medications, kinesio taping, patellar bracing, and an eccentric physical therapy program similar to that outlined by Kongsgaard et al [10]. He eventually was referred to a sports medicine physician, who performed 4 US-guided percutaneous needle tenotomies (PNTs) accompanied by paratenon hydrodissection during a 7-month period, without significant improvement seen in the patient. One month after the last PNT, the patient underwent arthroscopic right patellar tendon soft-tissue debridement with PRP injection. On the basis of available records, it was unclear whether the PRP was injected intraoperatively or postoperatively, and the specific components of the PRP were not recorded. Despite further physical therapy, including Graston techniques, the patient did not improve significantly after his surgical treatment.

Eleven months after surgery, the patient was referred to the senior author (G.A.M.) for further opinion. He continued to complain of activity-limiting proximal patellar tendon pain rated 7 of 10 on the visual analog scale with daily activities and 10 of 10 with physical activity. He had been unable to return to sport postoperatively. Findings of the physical examination were remarkable only for mild right quadriceps atrophy and exquisite palpatory tenderness at the inferior patellar pole, which reproduced his symptoms. Specifically, alignment was normal, there was no knee effusion or patellar crepitus, and quadriceps and hamstring lengths were symmetrical.

US examination using a 12-5 MHz linear array transducer with a LOGIQ-E US machine (GE Healthcare, Fairfield, CT) confirmed a 1.7-cm maximal diameter (medial-lateral) hypoechoic region within the mid-portion of the proximal patellar tendon (Figure 1A and 1B), accompanied by multiple calcifications and neovascularization. The overall appearance was consistent with chronic tendinosis accompanied by a superimposed defect (ie, tear versus postoperative change) and intratendinous calcification. After discussion of further treatment options, the patient elected to undergo a sonographically guided percutaneous ultrasonic tenotomy.

Detailed, informed consent was obtained from the patient and his father. The steps of the procedure as well as the efficacy of percutaneous ultrasonic tenotomy were explained in detail with reference to the current literature. The novelty of this particular device also was discussed, noting its similarities to PNT as well as its unique features. The rationale for performing these types of procedures based on basic science was described. The potential risks associated with the procedure, including the risk of a tendon rupture that would require surgical intervention, also were discussed in detail. The alternatives, which were limited to debridement and repair at that point in his care, also were reviewed. Details of the postprocedural rehabilitation and precautions as well as the rationale for these restrictions (ie, limited weight-bearing) were explained to the patient. Finally, the potential out-of-pocket costs of the sonographically guided percutaneous ultrasonic tenotomy and the platelet-rich plasma injection were discussed with the patient and his father.

Before the procedure, the affected portion of the tendon was identified on US with the knee flexed to 30° and the skin was marked appropriately. After sterile skin preparation, 1% lidocaine was used to anesthetize the skin and subcutaneous tissues. With the use of US guidance to visualize the patellar tendon in its long axis, a 25-gauge needle was used to deliver a mixture of 2 mL of 1% lidocaine and 8 mL of sterile normal saline around the tendon for peritendinous anesthesia. After this step, a small, vertically oriented stab incision was created in the skin and subcutaneous tissue using a #11 scalpel blade, extending through the paratenon. Thereafter, the working tip of the TX1 device (Tenex Health, Lake Forest, CA) was similarly advanced into the tendon using real-time US guidance and an in-plane, distal to proximal approach (Figure 2A and 2B).

Percutaneous ultrasonic tenotomy was then completed by activating the working tip via a foot pedal, resulting in tissue fragmentation and removal while precisely controlling the tip position with orthogonal long and short axis imaging relative to the tendon. The senior author treated the entire portion of the affected tendon and the associated calcifications using a total energy time of 2 minutes and 30 seconds.

After treatment, the area was cleaned and dressed with adhesive strips, gauze, and a sterile occlusive dressing. A PRP injection had been planned for and was performed immediately after the procedure for additional promotion of tendon healing. Sixty milliliters of whole blood was processed with an EmCyte centrifuge and Pure PRP system (EmCyte Corporation, Fort Meyers, FL) to produce 7 mL of PRP, which has been characterized by the manufacturer as leukocyte and red blood cell poor. The best data to date involves the use of PRP in the clinical setting of lateral epicondylosis using