Best Practices in Patellar Tendinopathy Management: An Evidence to Practice Review

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ABSTRACT

Patellar tendinopathy (PT) is a degenerative condition that is common in sporting populations due to the loads placed on the tendon during dynamic activity. PT often occurs in overtraining situations; however, it may also occur in conjunction with and/or worsen through poor biomechanics, persistent inflammation, and altered movement patterns. Although sports medicine practitioners have evidence to support the prevalence of this injury, we do not have a strong base of evidence surrounding the contributing factors and pathophysiology that lead the pain and disability reported in patients with PT. The purpose of this evidence to practice review was to summarize a systematic review on interventions to treat PT. The authors aimed to include any randomized controlled trial that treated patients with PT and used the Victorian Institute of Sport Assessment Patellar Tendon Questionnaire (VISA-P) as an outcome measure. Seven different PT interventions were described and summarized by the authors in this review. On the conservative end of the treatment spectrum, eccentric loading programs and extracorporeal shockwave therapy were found to be effective at reducing pain. More invasive approaches often utilized after failed conservative treatment, such as platelet-rich plasma injections and arthroscopic tenotomy, were also deemed effective. Therapeutic ultrasound and sclerotherapy were found to be ineffective treatments, and corticosteroid injections are contraindicated in patients with PT. The review highlights that both conservative and invasive treatment approaches can reduce pain in patients with PT. However, there is still no consensus on the optimal treatment protocols for patients with PT due to the variability in in protocols. Thus, we recommend utilizing an individualized approach and appropriate clinical judgement to guide treatments derived from a thorough patient history and physical/biomechanical examination to identify interventions with the highest likelihood of resolving symptoms.

Key Phrases
Therapeutic devices, therapeutic exercise, rehabilitation

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ORIGINAL REFERENCE AND SUMMARY

Everhart JS, Cole D, Sojka JH, Higgins JD, Magnussen RA, Schmitt LC, Flanigan DC. Treatment options for patellar tendinopathy: A systematic review. Arthroscopy. 2017;33(4):861-872.

SUMMARY

CLINICAL PROBLEM AND QUESTION

Patellar tendinopathy (PT) is a common, degenerative condition that affects up to 45% of collegiate and elite jumping athletes.[1] Many athletes with PT suffer from long-term knee pain and movement impairments which frequently causes athletes to limit or discontinue sport participation.[2,3] Several risk factors have been identified including an increased training load, decreased hamstring flexibility, an inferiorly-placed patella, and reduced quadriceps strength.[4,5] The majority of these risk factors are modifiable, suggesting there is a strong likelihood that patients can respond positively to therapeutic intervention.[4,5]

Despite the frequency of PT, the pathological sequence and contributing factors to the reports of pain and disability are not universally agreed

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upon. Histopathological findings of patients suggest symptoms are not due to the inflammatory response and are rather due to degeneration of the tissue.[6] Collagen fiber pattern disruption is often noticeable during sonographic examination in those with PT.[7] Although not an inflammatory response, the involved patellar tendon may show thickening and have a greater cross-sectional area upon inspection.[8,9] This poor understanding of the pathological sequence leads to a decreased ability to develop and identify treatments that can effectively treat PT. Due to the lack of consensus of the causes and perpetuation of PT, intervention protocols vary widely. Therefore, the purpose of the reviewed study was to assess the effectiveness of interventions used to manage PT.

SUMMARY OF LITERATURE

The guiding systematic review's authors conducted a systematic search of PubMed, Google Scholar, CINAHL, UptoDate, Cochrane Reviews, and SPORTDiscus to identify published clinical trials for the treatment of PT. Studies that were included in the systematic review had to meet the following inclusion criteria: (1) patients must have been diagnosed with chronic or acute PT, (2) used the Victorian Institute of Sports Assessment Patellar Tendinopathy Questionnaire (VISA-P) as an outcome, (3) have a clinical trial/therapeutic outcome design, (4) be reported in English, and (5) be an original research study published in a peer-reviewed journal.

The search identified 691 potential articles that were screened for inclusion criteria, resulting in a total of 15 studies included in the systematic review and meta-analysis. Five studies investigated eccentric exercise training, 4 studies evaluated surgical intervention, 4 studies evaluated extracorporeal shockwave therapy, 2 investigated platelet-rich plasma (PRP) injections, 2 evaluated steroid injection therapy, 1 evaluated therapeutic ultrasound, and 1 study investigated sclerotherapy.

SUMMARY OF INTERVENTIONS

Seven different treatment strategies were reported ranging from a more conservative approach of using eccentric therapeutic exercises to surgical intervention. Eccentric exercise protocols ranged from twice weekly to 7 days a week and from 5-weeks long to 12-weeks long. Exercises included eccentric strength training of the quadriceps and hamstrings, and single-limb squats on a 25° decline board. These were performed at a slow speed, approximate 30 seconds count, at 15 repetitions for three sets. Surgery involved both open and arthroscopic patellar tenotomy, with a range of post-operative rehabilitation protocols incorporating eccentric exercises. Extracorporeal shockwave therapy ranged from a single treatment session to 3 sessions in 3-day to 1-week intervals, with up to 1500 impulses of 0.18mJ/mm2. PRP injections were given in the most painful location, up to 2 treatments over a 2-week period. Up to two corticosteroid injections were investigated, and one protocol began eccentric rehabilitation exercises 3-4 days after receiving the steroid injection. Low-intensity pulsed ultrasound was applied for 20-minutes a day, 7-days a week for 12 weeks (2-ms burst of 1 MHz @ 100Hz). Sclerotherapy is a treatment that destroys microvessels that form during the pathophysiological sequela of PT; the investigation included in this SR used a single dose of a sclerosing agent guided by ultrasonography.

SUMMARY OF OUTCOMES

The authors of the guiding systematic review utilized the VISA-P to determine the efficacy of each PT intervention. The VISA-P is a patient-reported outcome that assesses the symptoms, ability to complete functional tasks, and ability to

complete sports.10 It can be scored within each domain, but composite scores range from 0 to 100, with 0 representing maximal levels of perceived disability, and 100 representing no symptoms (i.e. healthy).10 A minimal clinically important difference of 13 from pre- to post-testing has been established for the VISA-P.[11] With the ease of administration and grading, the VISA-P is a useful tool in determining treatment responses in patients with PT.

FINDINGS AND CLINICAL IMPLICATIONS

This systematic review assessed the evidence and elucidated intervention strategies that appear to be the most effective in patients with PT (**Table 1**). In addition, athletes and recreationally active individuals often push through activities despite their condition, playing, and practicing through low to moderate pain and symptoms. These behaviors make it difficult for clinicians as they may have to choose between symptom management rather than promote tissue healing.[12] Evidence also suggests that promoting tissue healing and managing symptoms are not mutually exclusive, as complete removal from sport may be contraindicated as loading is necessary to maintain healthy tendons.[13] The key for clinicians is to manage and reduce training loads, which can be done by utilizing a pain-monitoring model with visual analogue scales.[14] In addition, poor patient compliance with eccentric protocols are often implicated in the lack of overall success due to their painful nature.[15] Heavy slow resistance training has become popular as an alternative method to traditional eccentric exercises to improve patient outcomes, as the treatment techniques is considered less painful while demonstrating improvements of histological factors associated with tendon healing.[16]

Based on the findings of the systematic review, our own review of the evidence, and clinical expertise, we propose a framework for treating patients with PT (**Figure 1**). A thorough patient history and physical examination should be used to identify painful movements and any postural alignment issues/biomechanical insufficiencies which may need to be addressed during therapeutic rehabilitation. In both acute and chronic PT, the primary management strategy should consist of a two-pronged approach incorporating a loading program and therapeutic modalities. The loading program can aid in long-term pain relief, and should consist of eccentric and heavy slow resistance exercises (See supplemental videos).[17] Heavy slow

Table 1. Summary of Treatment Efficacy for Patients with Patellar Tendinopathy

Intervention	# of studies	Effect size of Improvement in VISA-P Scores (95% CI)
Eccentric Exercises	5	61% (53% to 69%)
PRP Injections	2	55% (5% to 105%)
Extracorporeal Shockwave Therapy	4	54% (22% to 87%)
Steroid Injections	2	20% (-20% to 60%)
Surgery	4	57% (52% to 62%)
Low-dose Therapeutic Ultrasound	2	50% (42% to 58%)
Moderate-dose Therapeutic Ultrasound	1	86% (82% to 90%)
High-dose Therapeutic Ultrasound	1	27% (21% to 34%)

Effect sizes reported reflect the magnitude of improvement on the VISA-P from pre-intervention scores. Thus, a pre-intervention score of 50 and a post-intervention score of 75 would represent a 50% improvement in the VISA-P. Based on this data, patellar tendinopathy patients treated with either eccentric exercises or surgery consistently display a positive response to their treatment.

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resistance exercises consist of a concentric action over a longer period of time (about 30 seconds),[17] thus emphasizes both concentric and eccentric strength of agonist and antagonist muscle groups. The current systematic review also supports the use of extracorporeal shockwave therapy and PRP injections for pain reduction in patients with PT. Extracorporeal shockwave therapy has also shown efficacy in patients with medial tibial stress syndrome.[18,19] However, it is an expensive treatment and not practical for all athletic trainers. Therefore, we recommend one considers both the time and financial investments implicated with using extracorporeal shockwave therapy when treating patients with PT. If pain and function fail to improve in your patient over a 6-month period, we suggest athletic trainers refer their athlete to a surgeon to discuss a patellar tenotomy. Surgery has been shown to be effective in the long-term at reducing pain in patients with PT. However, this is not the ideal approach for all athletes or patients with PT, thus we also suggest several adjunct therapies. Consistent evidence supports the use of isometric exercises for reducing pain in patients with PT.[17] PRP injections may also be used, either prior to beginning a loading program, or afterwards to accelerate recovery. Strapping may also be considered when managing patients with PT, as infrapatellar strapping has been shown to reduce pain and alter lower limb biomechanics.[20,21] Ineffective approaches include both low- and high-dose therapeutic ultrasound, as well as sclerotherapy. Corticosterioid injections may sound like a logical treatment, however they are contraindicated for patients with PT and should not be used. While this systematic review reports varied levels of efficacy of different treatments for reducing pain in patients with PT, they all used the VISA-P as an outcome. We strongly recommend clinicians continue to utilize such validated patient-reported outcomes as a mean to track treatment success and aid in the clinical decision-making process. We also recommend incorporating quality improvement practices that utilizes patient-reported outcomes to address patients on an individual basis, in an effort to optimize your clinical management of patients with PT.

CLINICAL BOTTOM LINE

Several treatment protocols are available with varying success to manage patients with PT. Exercise protocols including isometric, eccentric, and heavy slow resistance exercises often report the best patient outcomes. Extracorporeal shockwave therapy and PRP injections are also effective adjuvant interventions, and can be incorporated when a patient is not responding to an initial conservative treatment approach. Failed conservative treatments often lead to surgical interventions such as debridement to remove degenerative tissues to promote healing. Due to the wide variety of options, there is no consensus on the optimal treatments to improve outcomes in patients with PT. However, the literature shows that nearly all patients with PT can be treated effectively. Considerable evidence supports the use of conservative eccentric loading exercises, however, in lieu of a positive response to such conservative approaches, surgical intervention is effective at improving patient outcomes.

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Figure 1. Overview of effective therapies and recommended course of treatment.