

REVIEW

Tendon needling for treatment of tendinopathy: A systematic review

David Krey, James Borchers & Kendra McCamey

The Ohio State University Sports Medicine Center, Columbus, OH, USA

Abstract

Objective. To summarize the best available evidence to determine if tendon needling is an effective treatment for tendinopathy. **Data source.** Medline and Cochrane Databases through November 2013. **Review methods.** Utilizing the search terms *tendinopathy, needle, needling, tenotomy, dry needling, needling tendon, needle fenestration, and tendon fenestration*, 17 articles were identified through our systematic literature search. Of these, 4 studies met the inclusion criteria. Four independent reviewers reviewed the articles. The study results and generated conclusions were agreed upon. **Results.** The studies that were included in this review suggest that tendon needling improves patient reported outcomes in patients with tendinopathy. In 2 studies evaluating tendon needling in lateral epicondylitis, one showed an improvement in a subjective visual analogue scale score of 34% (significant change > 25%) from baseline at 6 months. The other showed an improvement of 56.1% in a visual analogue scale score from baseline. In 1 study evaluating tendon needling in addition to eccentric therapy for Achilles tendinosis, the subjective Victorian Institute of Sport Assessment–Achilles (VISA-A) score improved by 19.9 (significant change > 10) (95% CI, 13.6–26.2) from baseline. In 1 study evaluating tendon needling in rotator cuff tendinosis, the subjective shoulder pain and disability index showed statistical significant improvement from baseline at 6 months ($P < 0.05$). **Conclusions.** The evidence suggests that tendon needling improves patient-reported outcome measures in patients with tendinopathy. There is a trend that shows that the addition of autologous blood products may further improve these outcomes.

Keywords:

Dry needling, needle fenestration, tendinopathy, tendinosis

History

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Introduction

Overuse tendinopathy is a clinical syndrome characterized by chronic pain and tendon thickening. It commonly results from overuse, and it occurs in many patients who are engaged in strenuous physical activity, such as laborers and athletes of all levels. The majority of tendinopathies present chronically, with symptoms usually having occurred > 3 months in duration [1]. Historically, overuse tendinopathy was commonly referred to as tendinitis, and the *-itis* suffix implicated inflammation as the primary cause of pain and swelling. A classic inflammatory reaction is typically absent with overuse tendinopathy, or only minimally present in adjacent soft tissue [2]. The pathophysiology underlying most cases, as seen in tissue analysis from a variety of commonly affected tendons, is tendinosis. Tendinosis can be described as an unsuccessful healing response within the tendon tissue [3]. This failed healing response is associated with characteristic findings on ultrasound and magnetic resonance imaging [4]. Histologically, the appearance of tendinosis entails fibrin deposition, neovascularization, reduction in neutrophils and macrophages, and an increase in collagen breakdown and synthesis. The resultant tissue consists of a disorganized

matrix of hypercellular and hypervascular tissue that is painful and weak [5,6].

Tendinopathy is a common yet challenging diagnosis facing clinicians. It has been demonstrated as one of the most common reasons that patients seek medical attention for a musculoskeletal condition and it accounts for approximately 30% of musculoskeletal complaints to general practitioners [7]. Hundreds of thousands of workers are affected by overuse tendinopathies each year, causing significant loss of work time [8]. Commonly affected areas of tendon injury include the Achilles, patellar, medial, and lateral epicondyle, and the rotator cuff. It is important that practitioners understand the pathophysiology, diagnostic criteria, and treatment of tendinopathies, so that they can help minimize the patient's pain, accelerate the patient's return to work or play, and reduce the economic impact of lost productivity in the workforce [9].

As more is being learned about the epidemiology, diagnosis, and histology of tendinopathy, the best treatment option remains unclear. Anti-inflammatory medications and glucocorticoid injections are of little benefit for the long-term treatment of tendinopathy, but surgery should be considered the last resort because of the morbidity it entails and its inconsistent outcomes [10]. The initial treatment usually

entails rest, activity modification, bracing, and physical therapy. When these conservative options fail, there are different options that have been shown in recent years to stimulate tissue regeneration. Some of these treatments include topical nitroglycerin patches, extracorporeal shock-wave therapy, tendon needling, autologous blood products, and platelet-rich plasma (PRP). All these options are proposed treatments to assist in the healing of the tendon by promoting the introduction of healing factors to the tendon [11], and all have demonstrated mixed results in the literature.

Limited data exists on the benefits of tendon needling (also known as percutaneous needle tenotomy or tendon fenestration) as a stand-alone treatment for tendinopathy, although there are encouraging results in case series in the literature [12-15]. Tendon needling involves repeatedly fenestrating the affected tendon, which is thought to disrupt the chronic degenerative process and encourage localized bleeding and fibroblastic proliferation. This, in turn, is thought to lead to ordered collagen formation and ultimately healing of the tendon [16]. In addition to needling alone, the use of blood growth factors in treating tendinopathies has been more extensively researched, and interest has grown in their use for the treatment of tendon, soft tissue, and bony injury. Several different autologous concentrates exist such as PRP and autologous conditioned plasma (ACP), and these vary in their platelet concentrations [17].

Although tendinopathy is a common reason why patients seek medical care, the best intervention for refractory cases not responsive to conservative management is still unknown. Improper diagnosis and subsequent treatment can lead to chronic problems and potentially surgery, which still may not prevent recurrence. The use of autologous blood products in addition to dry needling have been shown to be effective in case series [16,18-20]. Autologous blood products can be an additional cost to the patient as opposed to needling alone. It is uncertain if needling of the diseased tendon alone can result in pain relief, return to function, and improved histologic change of tendinopathy. This systematic review evaluates the best available literature to determine if needling alone is an effective treatment for tendinopathy.

Methods

A literature review was completed using Medline and Cochrane Database searches up to November 2013 to identify all English-language and translated clinical papers that evaluated the use of tendon needling for the treatment of tendinosis. Tendon needling was defined as using a needle for intervention into a tendon, either with or without ultrasound use for visualization. Tendinosis was defined as chronic tendinopathy or chronic tendonitis lasting ≥ 3 months. Several key search terms were used to narrow our literature search. The first term, tendinopathy, returned 7217 articles. Reentering tendinopathy as a Medical Subject Headings (MeSH) term yielded no additional articles. Key search terms used for intervention initially included needle, needling, and tenotomy. These terms, used independently, generated a total of 155 171 articles. When each term was independently combined with tendinopathy, 229 articles were identified. An additional

Medline search was done using the independent search terms dry needling, needling tendon, needle fenestration, and tendon fenestration. This search generated a total of 242 articles. Using needling of a human tendon for intervention narrowed the returns to 17 articles.

A secondary search of references from relevant articles was also performed, yielding no additional articles. Additional searches of EmBase/Scopus, SportDiskus, and the gray literature (sources of information that fall outside the mainstream of published journal and monograph literature) revealed no additional articles. Further criteria were then applied to the 17 relevant articles. Articles had to be of level I or II evidence (prospective study, systematic review of level I studies, retrospective study, study of untreated controls from previous randomized controlled trials [RCTs], or systematic review of level II studies). Applying these criteria, 4 articles were identified as meeting our criteria (Figure 1). The remaining 13 articles were excluded because they were not of level I or II evidence (case series).

Three independent reviewers, using predetermined methodology as described by Spindler et al. [21], reviewed the 4 articles in this systematic analysis and reached a consensus through discussion that the articles chosen were of level I or II evidence. The study methods and demographic data were first identified with attention to the study type, objectives, outcome measures, and examined cohorts. The study results and generated conclusions were extracted and agreed upon.

Results

Results for the 4 studies meeting inclusion criteria for this systematic review are summarized in (Tables I and II).

Studies

Stenhouse et al. [17], using a prospective randomized design, evaluated tendon needling with or without ACP as a stand-alone procedure for refractory lateral epicondylitis. Ultrasound was used to diagnose tendinosis in 28 patients, with an average age of 49, who had ≥ 6 months of symptoms and failed ≥ 1 trial of conservative management. Each patient received 2 separate interventions 1 month apart. The ultrasound-guided tendon needling procedure described by the authors used a "peppering" technique in which the needle was passed through the long axis of the tendon 40 to 50 times for about 2 minutes. Subjective symptom scales, which were validated in prior studies, were done at 2 and 6 months. These scores improved significantly with tendon needling alone at the 2- and 6-month follow-up. At 6 months, the tendon needling-alone group improved by 34% (significant improvement defined as $> 25\%$) in the primary outcome measure which was a 10-point visual analogue scale (VAS). There was no significant difference with the addition of ACP, but there was a trend toward improvement in this group.

The study was limited by being conducted at a single center, having a small sample size, and not including a power analysis. The aim of this study was to evaluate the benefit of the addition of ACP to needling alone. The needling alone group was seen as the control group, so there lacked a true

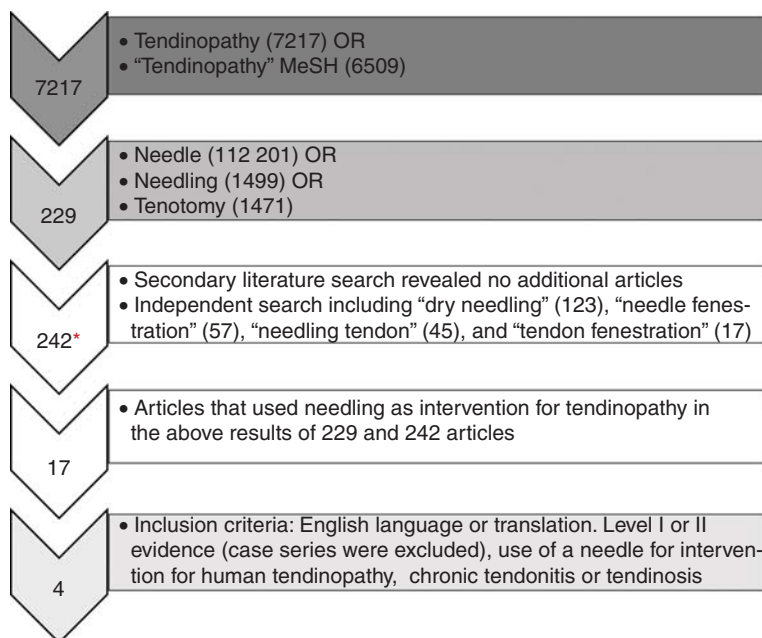


Figure 1. Diagrammatic illustration of systematic literature search. Primary search terms and results (first box), secondary search results (second box), and applied inclusion criteria and results (bottom box) are shown. The number of articles identified by each search term is noted in parentheses.

*Independent search terms used and the total number of articles relevant to those search terms.

control group in which no intervention was done. The authors state that because there is evidence behind both treatments, they felt it would have been unethical to include a true control group.

Mishra et al. [22] used a prospective double-blind design to evaluate tendon needling with or without the addition of PRP in refractory lateral epicondylitis. A total of 225 patients with a mean age of 48 were included. Patients had ≥ 3 months of symptoms and failed either a local corticosteroid injection, physical therapy or a trial of nonsteroidal anti-inflammatory drugs. Each patient underwent the procedure once, which was needling of the tendon 5 times with or without the addition of PRP. Successful treatment was set at a $> 25\%$ improvement on a VAS. Both groups showed improvement in VAS scores and elbow tenderness over the 24 weeks of the trial. At 24 weeks, 54% of patients in the needling-alone group had elbow tenderness, whereas 29% of the PRP group had tenderness. The VAS scores improved from 12 to 24 weeks from 47.4% to 56.1% in the needling-alone group, and 68.3% were determined to have had successful treatment. The corresponding VAS score change in the PRP group was 55.1% to 71.5%, and 83.9% were determined to have had successful treatment. This paper, as well as the Stenhouse study, evaluated elbow pain using a VAS. There was a statistically significant change in both groups from baseline in the primary outcome measures. The VAS used in this study was on a 0 to 100 scale that differed from the 0 to 10 scale used in the Stenhouse study, so a direct comparison of the studies cannot be made.

The strengths of this study were that it was a double-blind multicenter trial, and there was no difference in success rates across the different centers. The needling technique was consistent throughout the centers as well. One limitation, in regard to this review, was that the authors' conclusions were

based on the use of PRP in addition to needling, whereas needling alone was again the control group. As in the Stenhouse study, the authors state that no true control group was used because it was deemed unethical to deny treatments to patients still complaining of tenderness despite other nonoperative treatments. This study did do a sample size and power analysis prior to the study, but total enrollment was limited to about half of what was calculated for the study. In contrast to the Stenhouse article, ultrasound was not used to visualize the tendon needling, so we cannot assume that each individual tendon was accurately needled. Other limitations the authors mention are that the study may have benefited from a longer follow-up of 1 to 2 years and from the addition of standard rehabilitation to both groups.

Bell et al. [23] used a prospective double-blind design to assess the effectiveness of pain and function of 2 peritendinous needling procedures, with or without the use of autologous blood, for midportion Achilles tendinopathy. Additionally, both groups in this study underwent a standardized 12-week eccentric calf strengthening program. In total, 50 patients, with a mean age of 49, who had 3 months of symptomatic midportion Achilles tendinopathy, were included in the study. Ultrasound was used to confirm the diagnosis but it was not used to guide needling with or without injections. For the needling procedure, the authors stated that the needle was inserted 3 times into the area of the tendon. First it was inserted perpendicular to the tendon, and then in the second and third passes it was aimed 20 degrees superiorly and inferiorly, respectively. Both groups demonstrated clinically worthwhile improvements by 6 months.

The strengths of this study include that it was a double-blind randomized trial that had good participation and compliance. Also, sample size calculation and power analysis were performed and appropriately met. The authors described

Table I. Systematic review: demographics and methods.

Authors and journal	Objective	Study type	Population	Cohorts	Primary/secondary outcomes
Stenhouse et al, [17] Skeletal Radiology, 2013	To evaluate whether ACP offers any therapeutic advantage versus ultrasound-guided tendon needling for refractory lateral epicondylitis	Prospective randomized trial	28 patients (11 men, 17 women) mean age 49 with ≥ 6 months of refractory lateral epicondylitis (mean of 19 months of symptoms)	US guided tendon needling \pm ACP	Primary: VAS to assess pain, Nirschl score to assess elbow function and patient satisfaction at 2 and 6 months
Mishra et al, [22] American Journal of Sports Medicine, 2014	To evaluate the clinical value of tendon needling with PRP in patients with chronic tennis elbow compared with tendon needling alone	Double-blind, prospective, randomized trial	230 (225 with follow-up) patients (mean age 47 in needling alone vs 48 in PRP group) with at ≥ 3 months of symptoms	Tendon needling \pm PRP	Primary: VAS pain scores at 12 and 24 weeks Secondary: PRTEE and extended wrist examination at 12 and 24 weeks
Bell et al, [23] BMJ, 2013	To assess the effectiveness of 2 peritendinous autologous blood injections versus peritendinous needling alone in addition to standardized eccentric calf strengthening program in improving pain and function in patient with midportion Achilles tendinopathy	Double-blind, prospective, randomized trial	53 (50 completed) patients (mean age 49, 53% men) with symptomatic unilateral midportion Achilles tendinopathy for ≥ 3 months	Tendon needling \pm autologous blood	Primary: Change from baseline in VISA-A score at 6 months. Secondary: Participants perceived rehabilitation and their ability to return to sport
Rha et al, [24] Clinical Rehabilitation, 2013	To compare the effects of ultrasound-guided tendon needling with or without PRP on shoulder pain and function in patients with rotator cuff disease	Double-blind, prospective, randomized trial	39 (30 with follow-up) patients (mean age 52 in PRP group and 54 in the dry needling group) with a supraspinatus tendon lesion (tendinosis or partial tear < 1.0 cm, but not complete tear) with pain duration of 6 months (mean of 9 months)	US guided tendon needling \pm PRP	Primary: The Shoulder Pain and Disability Index and passive range of motion of the shoulder at 6 months

Abbreviations: ACP = Autologous conditioned plasma; PRP = Platelet-rich plasma; PRTEE = Patient-rated tennis elbow evaluation; US = Ultrasound; VAS = Visual analogue scale; VISA-A = Victorian institute of sport assessment-achilles.

Table II. Systematic review: results and conclusions.

Authors and journal	Results	Conclusions
Stenhouse et al, [17] Skeletal Radiology, 2013	1. At 2 months tendon needling VAS improved by 12.4% and Nirschl by 5.83 points versus 27.1% ($P = 0.76$) and 20.3 ($P = 0.72$) in the ACP group. 2. At 6 months tendon needling VAS improved by 34% and Nirschl by 22.5 points versus 48.5% ($P = 0.74$) and 40 ($P = 0.82$) in the ACP group.	Both interventions show clinical effectiveness. There was no statistical significant difference between groups at 2 or 6 months status postintervention.
Mishra et al, [22] American Journal of Sports Medicine, 2014	1. At 12 weeks the PRP VAS improved by 55.1% compared to 47.4% with tendon needling alone ($P = 0.094$). 2. At 24 weeks the PRP VAS improved by 71.5% compared with 56.1% with tendon needling alone ($P = 0.027$). 3. At 12 weeks PRP elbow tenderness was 37.4% versus 48.4% in tendon needling alone ($P = 0.036$). 4. At 24 weeks PRP elbow tenderness was 29.1% versus 54% in tendon needling alone ($P < 0.001$). 5. PRP Success rate at 24 weeks was 83.9% compared with 68.3% with tendon needling alone ($P = 0.012$).	Both interventions show clinical and therapeutic effectiveness. Tendon needling with the addition of PRP showed statistical significant improvement compared with tendon needling alone with primary and secondary outcomes.
Bell et al, [23] BMJ, 2013	1. At 6 months the autologous blood VISA-A improved by 18.7 (95% CI, 12.3–25.1) versus 19.9 (13.6–26.2) in the tendon needling group. 2. The overall effect of treatment was not significant ($P = 0.689$) and the 95% CI at all points precluded clinically meaningful benefit or harm. 3. There was no significant difference between groups in secondary outcomes or in the levels of compliance with the eccentric calf strengthening program.	Both groups demonstrated clinically worthwhile improvements by 6 months. However, both groups underwent eccentric rehabilitation, and there was no additive benefit with intervention in the primary and secondary outcomes.
Rha et al, [24] Clinical Rehabilitation, 2013	1. At 6 months the PRP mean Shoulder Pain and Disability Index was 17.7 ± 3.7 versus 29.5 ± 3.8 in the tendon needling alone group ($P < 0.05$). 2. Both groups showed a significant reduction in the Shoulder Pain and Disability Index and improvement of ROM over 6 months ($P < 0.05$).	Both interventions demonstrated clinically worthwhile improvements at 6 months. Tendon needling with the addition of PRP showed significant benefit to tendon needling alone in the Shoulder Pain and Disability Index but not in ROM.

Abbreviations: ACP = Autologous conditioned plasma; CI = Confidence interval; PRP = Platelet-rich plasma; PRTEE = Patient-rated tennis elbow evaluation; ROM = Range of motion; VAS = Visual analogue scale; VISA-A = Victorian institute of sport assessment–achilles.

their exact needling technique, but the technique differed significantly from those in the previously mentioned trials. In this trial, the needling technique resembles that of a true control group versus needling as an intervention group as seen in the other 3 studies in this review. Like the Mishra study, needling was unguided and the accuracy of needling the tendon was not confirmed. Another limitation was that this was a single-center trial. Lastly, patients in this study did not have to fail conservative management to be included in this study. The authors state that patients were not excluded if they had already undertaken eccentric rehabilitation, but it was not necessary for patients to have tried therapy first. As mentioned, both groups underwent eccentric rehabilitation, which has been shown to be beneficial. The results show that there was no added benefit with either intervention.

Rha et al. [24] used a prospective double-blind randomized design to compare the effects of tendon needling, with or without PRP, on pain and function in patients with rotator cuff disease; 30 patients were ultimately studied with a mean age of 52. Patients were included if they had symptoms for ≥ 6 months, failed conservative management for 3 months, and had evidence of tendinosis or partial tear on ultrasound. Two needling procedures with or without PRP were done 1 month apart. The technique in this study was similar to that in the Stenhouse study, in that both groups had their tendon needled 40 to 50 times under ultrasound guidance. There were significant subjective clinical improvements in both groups at 6 months. Unique to this study was that the authors

also looked at objective ultrasound evidence of healing. There were objective findings of healing seen in both groups with a trend toward more improvement with the addition of PRP.

The limitations of this study include that it was a single-center trial and it did not undergo sample size calculation and power analysis. Therapy was done in this study, but it was unstructured and unsupervised. There was some heterogeneity in regard to diagnosis on ultrasound, with both tendinosis and partial tears being included in this study. However, each group had similar numbers of these diagnoses. The only imaging modality used in this study was ultrasound. Therefore, an alternative diagnosis not involving a tendon could have been missed by ultrasound alone, and the interventions studied may not have provided beneficial treatment.

Discussion

As our search methods and criteria were chosen prior to our search, our review process provided us with high-quality RCTs. In all 4 of the studies that were evaluated, the control group was tendon needling alone and the intervention group was tendon needling with the addition of either PRP, autologous blood, or ACP. With tendon needling as the control group, and authors evaluating the benefit of an additional intervention, outcomes would likely favor the additional intervention being studied. The intention of this review was to determine if tendon needling can be beneficial as a stand-

alone treatment for tendinopathy. The benefits of needling alone have been demonstrated in multiple case series looking at a variety of tendons and different needling techniques [12-15]. Tendon needling alone does not require additional blood draws or additional equipment, and is potentially less costly. However, to our knowledge, there are no long-term outcome data on symptom improvement, total cost, lost time from work, need for surgery, and quality-of-life measures when comparing needling alone to injected biologics or other interventions for tendinopathy. In the Mishra and Stenhouse studies, the authors state that having an actual control group with no intervention would be unethical, as patients have already failed conservative management.

The 4 studies evaluated in this review, although high-quality RCTs, lack uniformity among the study designs. First, there was heterogeneity with the location of the tendinosis. Two studies looked at the lateral epicondyle, 1 at the rotator cuff, and 1 at Achilles tendinopathy. To date, we do not know if certain tendons are more amenable to needling intervention than others given the difference in daily use, weight bearing or non-weight bearing, physical demands, and other factors that vary with the anatomic location. Of note, there have been reviews looking at different treatment for the same tendon [25-27] but none looking at needling alone for the same or different tendons. The Stenhouse and Mishra studies were both RCTs that followed patients for 6 months after intervention for lateral elbow tendinopathy. However, they differed in their inclusion criteria, numeric VAS scale, ultrasound use, needling technique, and intervention group. Both showed statistically significant improvements with tendon needling, but we cannot make direct conclusions because they varied in methodology.

The needling technique also widely varied in the groups studied. The Stenhouse and Rha studies both needled their respective tendons using a peppering technique in which the tendon was needled 40 to 50 times under ultrasound guidance. This technique was performed twice, 1 month apart, in both groups. The Mishra and Bell studies did not use ultrasound guidance, and tendons were needled 5 and 3 times, respectively. Also, compared with the Stenhouse and Rha studies, the procedure was done only once. In the Mishra and Bell studies, the needling-alone groups could be viewed as a placebo control group. However, it is unknown if needling multiple times as in the Stenhouse and Bell studies is more beneficial than the number of times used in the Mishra and Bell studies. In addition, there are no high-quality data that ultrasound use or multiple needling procedures provide added benefit. With the growing use of musculoskeletal ultrasound in clinical practice, controlled trials are needed to assess its importance for use in tendon needling. In addition, further research assessing needling technique and how often to perform tendon needling is also needed.

The timing of the intervention was also different among groups. In the Mishra and Bell studies, patients had to have symptoms for ≥ 3 months. In the Stenhouse and Rha studies, patients had to have symptoms for ≥ 6 months. Not only was there a difference in the inclusion criteria for length of symptoms, but the mean duration of symptoms also differed widely between studies. Additional research is warranted to

see if improvements in symptoms after tendon needling are time sensitive.

Stenhouse et al stated that 10% of their patients eventually went on to surgery [17]. This percentage of patients who still underwent surgical intervention is similar to previously published literature [28,29]. Because of the wide variety of methodology and outcome measures, it is again hard to draw conclusions as to which patient would benefit from needling, the best needling technique, when to intervene, how often to intervene, and if ultrasound use improved the needling procedure in regard to long-term outcomes.

The Rha study was the only study in this review that looked at objective ultrasound data, which was done at 6 months after needling. There were improvements seen within the rotator cuff tendons, but direct individual clinical correlations were not made. The role of diagnostic ultrasound at follow-up visits has not been established. There are case series showing clinical and ultrasound improvements with the combination of tendon needling and autologous blood [16,20]. As seen in the 4 studies of this review, patient-reported outcome measures and improvement in symptom scores are being used more to evaluate the benefit of interventions. Because of this, the use of follow-up ultrasound to document changes consistent with healing may be educational and needed for research, but may not be justified in clinical practice.

Another inconsistency among studies was whether or not therapy was used after the procedure. It is not known if therapy should be continued or discontinued after needling. The Bell study, as mentioned previously, used a structured eccentric rehabilitation program in addition to PRP or tendon needling. In the other 3 studies, there was no structured rehabilitation protocol listed. The proper postintervention protocol is not known. This would also include, but is not limited to, the use of therapy, the amount of rest, the use of bracing, and medication use.

This systematic review has limitations. The search strategy and inclusion criteria that were used were limited to high-level randomized trials with control groups. This strategy produced only 4 articles meeting the criteria for this review. There are numerous studies of lesser levels of evidence that address tendon needling for tendinopathy, but their results are limited by study methodology and lack of control groups. We do recognize that these case series may contribute to the overall body of literature on this topic, but our purpose was to examine the highest level evidence to arrive at conclusions regarding tendon needling for tendinopathy.

Conclusion

Tendinopathy is a chronic noninflammatory process that can affect a wide range of patients across a wide age range and different tendons. Based on the results of our systematic review, there is benefit from tendon needling for tendinosis in regard to patient-reported outcomes. Despite these results, more high-quality evidence is needed to further evaluate the benefit of tendon needling for tendinopathy. Randomized controlled trials focusing on the timing of the intervention, ultrasound guidance, the needling technique, and how often

to intervene would be beneficial. The focus of this review was on needling as an intervention for tendinopathy. However, the studies in this review demonstrated a trend toward improvement with the addition of blood products. Differences in regard to the blood products used, subjective assessments, and tendons that were studied make it hard to conclude which technique is superior. It is also not known if needling enhances the use of the injected blood products. Lastly, research is needed not only on the treatment of tendinopathy but also on the epidemiology and risk factors that contribute to tendinopathy to better understand diagnosis, management, and prevention.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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