CHIROPRACTIC MANAGEMENT OF TENDINOPATHY: A LITERATURE SYNTHESIS

Mark T. Pfefer, RN, MS, DC,a Stephan R. Cooper, DC,b and Nathan L. Uhl, DCc

ABSTRACT

Objective: Chronic tendon pathology is a soft tissue condition commonly seen in chiropractic practice. Tendonitis, tendinosis, and tendinopathy are terms used to describe this clinical entity. The purpose of this article is to review interventions commonly used by doctors of chiropractic when treating tendinopathy.

Methods: The Scientific Commission of the Council on Chiropractic Guidelines and Practice Parameters (CCGPP) was charged with developing literature syntheses, organized by anatomical region, to evaluate and report on the evidence base for chiropractic care. This article is the outcome of this charge. As part of the CCGPP process, preliminary drafts of these articles were posted on the CCGPP Web site www.ccgpp.org (2006-8) to allow for an open process and the broadest possible mechanism for stakeholder input. A literature search was performed using the PubMed; Cumulative Index to Nursing and Allied Health Literature; Index to Chiropractic Literature; Manual, Alternative, and Natural Therapy Index System; National Guidelines Clearinghouse; Database of Abstracts of Reviews of Effects; and Turning Research Into Practice databases. The inclusion criteria were manual therapies, spinal manipulation, mobilization, tendonitis, tendinopathy, tendinosis, cryotherapy, bracing, orthotics, massage, friction massage, transverse friction massage, electrical stimulation, acupunture, exercise, eccentric exercise, laser, and therapeutic ultrasound.

Results: There is evidence that ultrasound therapy provides clinically important improvement in the treatment of calcific tendonitis. There is limited evidence of the benefit of manipulation and mobilization in the treatment of tendinopathy. Limited evidence exists to support the use of supervised exercise, eccentric exercise, friction massage, acupuncture, laser therapy, use of bracing, orthotics, and cryotherapy in the treatment of tendinopathy.

Conclusion: Chiropractors often provide a number of conservative interventions commonly used to treat tendinopathy. (J Manipulative Physiol Ther 2009;32:41-52)

Key Indexing Terms: Manual Therapies; Manipulation, Spinal; Chiropractic; Tendinopathy; Cryotherapy; Braces; Orthotic Devices; Electrical Stimulation; Acupuncture; Exercise; Exercise Therapy; Laser Therapy, Low Level

Chronic tendon pathology is a soft tissue condition commonly seen in chiropractic practice.1 Tendonitis, tendinosis, and tendinopathy are terms used to describe the same clinical entity. Although colloquially known as tendonitis, this term is misleading because this condition has not been associated with inflammation.2 Studies have to date been unable to appreciate any intratendinous acute inflammatory cells or inflammatory cascade. As such, rather than tendonitis or tendinosis, the preferred term for this condition is tendinopathy, as this term makes no etiopathologic implication.3,4

Some common tendinopathies include rotator cuff (eg, supraspinatus) tendinopathy, calcaneal or Achilles tendinopathy, lateral and medial epicondylopathy, patellar tendinopathy, and various wrist tendinopathies such as extensor carpi radialis tendinopathy. Other less common or uncommon tendinopathies have been documented, such as that of the longus colli5 retropharyngeal prevertebral musculature,6 iliopsoas,7 quadratus femoris,8 popliteus,9 and the pes anserine.10

ILLNESS BURDEN

These common tendon disorders place a burden on health care resources, particularly with regard to occupational and sports-related injuries.11,12 In 2006, the US Department of Labor, Bureau of Statistics, showed that work-related musculoskeletal disorders, which include tendinopathies, were associated with increased time away from work.13 The average number of lost time days for tendonitis has increased from 11 days in 2003 to 14 in 2006.13 Bonde et al14 reported
the duration of shoulder tendinopathy disability in Danish industrial service workers to be in the order of 10 months for 50% of people with the disability. In a Canadian study, Yassi et al. found that the most frequent upper limb diagnosis submitted to the worker’s compensation board was tendinitis. They go on to report that claimants had symptoms for an average of 8 months before reporting the injury.

Chronic disability is associated with higher health care and societal costs. Baldwin and Butler examined the costs and outcomes after the initial return to work of an injured worker. They found that a substantial proportion (26%) of workers with cumulative trauma disorders, such as tendinopathies, experienced further injury-related absences after the initial return to work. This may lead to underestimates in the overall costs of these injuries.

HISTOPATHOLOGY

Tendons are a dense parallel-fibered collagenous connective tissue containing an organized fibrillar matrix. The tendon matrix consists primarily of type I collagen, proteoglycans, and glycoproteins. Although type I collagen is predominant, other collagens may however also be present in lesser and varying amounts. The exact composition of each tendon differs based on its function, such as extremity tendons, which have a higher percentage of their dry weight made up of collagen.

Tenocytes are fibroblast-like cells within the tendon and are responsible for tissue maintenance and matrix remodeling. The structure of individual tendons is determined by tenocyte metabolism, which in turn may be influenced by factors such as biomechanical loading.

Animal models of tendinopathy have shown changes in the resident tenocyte and the structure of the tendon with repeated loading. A recent animal model study by Scott and et al. found 4 diagnostic morphologic changes in rat supraspinatus tendinopathy. Those changes were fibroblastic alterations (hyper- or hypocellularity), increased glycosaminoglycan staining, collagen disorganization or disarray, and hypervascularity. Supporting the hypothesis that tendinopathy is not inflammatory, they found no extrinsic cellular invasion in the tendinopathic rats. They also found no evidence of apoptosis in the tendinopathy group.

Tenocyte morphology also changed. After repetitive loading, the tenocytes appeared to have a rounded chondrocytic appearance. Other authors support this observation. Furthermore, they suggest that tenocyte proliferation may be caused by an insulin-like growth factor autocrine signaling response.

Other tendinous changes have been noted. These changes include hypervascularity; tendinous microtears; increased type III collagen, fibronectin, tenasin-C, and matrix glycosaminoglycans; increased expression of chondroitin sulfate proteoglycans, aggrecan, and biglycans; increased water content; increased denatured collagen; upregulation of collagen type I and type III gene expression; increased metalloproteinase activity; and altered matrix metalloproteinase gene expression. Metalloproteinase enzymes have been implicated, at least in part, in the cell-mediated changes seen in tendinopathy.

RISK FACTORS

Biomechanical risk factors have been studied extensively. Tendons are suited to sustaining great tensile loads. Other loads are not as well accommodated. Corps et al. found tendon changes in tendinopathy to be consistent with adaptive responses to shear or compression. Repetition and forceful exertion have also been implicated as causal factors in the development of tendinopathies.

Personal risk factors include advancing age and obesity. Increasing age has been associated with increased risk of developing tendinopathy and delayed recovery. Frey and Zamora found that patients who were overweight or obese significantly increased their risk of developing “tendinitis” in general.

The role of genetics on the development of tendinopathies is currently being explored. The COL5A1 gene and the TNC gene have been identified in Achilles tendinopathy. Type V collagen fiber assembly and diameter are associated with the COL5A1 gene. The TNC gene encodes for tenascin-C, which is important in regulating the tendon’s response to a mechanical load.

Although biomechanical and histologic analyses have helped shed light on the etiopathogenesis of tendinopathy, disability due to this condition appears to be complex and multifactorial. Leclerc and et al. found that psychosomatic problems and social support at work were predictive of wrist “tendinitis.” They also found that previous upper limb disorders and depressive symptoms predicted a first occurrence of lateral epicondylitis. Other studies support the key role of psychosocial factors in tendinopathy severity and disability. Therapies aimed at reducing this condition should take these factors into account.

DIAGNOSIS

The onset of most tendinopathies is insidious. The pain is localized and described as “sharp” or “stabbing” with activity. Often there has been a history of a recent increase or change of activity that coincides with the onset of pain. The patient may report that the pain increases with activity but diminishes shortly after a warm-up period. This is most common early in the progression of this condition. Later, however, the patient may feel a “dull” or “achy” type of pain after activity or even at rest.

Provocative palpation of the tendon tends to reproduce the patient’s pain in a well-localized pattern. Tests that load the tendon similarly to inciting activities can also recreate the patient’s pain and help support the diagnosis.
Plain-film imaging is generally not helpful in simple cases; however, calcific tendinopathy may be seen on plain films. Characteristic tendinopathic changes seen on advanced imaging, such as magnetic resonance imaging or ultrasound, do not correlate well with clinical symptoms. As such, these imaging modalities should be used if the diagnosis remains unclear after a thorough history and examination.

**Therapeutic Interventions**

Currently, there are several treatment modalities used that are outside the scope of chiropractic practice. It is incumbent upon chiropractors to be aware of other treatment options to inform their patients before consent or in the event that conservative treatment regimes are ineffective.

Nonsteroidal anti-inflammatory drugs (NSAIDs) are commonly used to treat tendinopathies. However, as previously mentioned, chronic tendinopathies are not inflammatory in nature. A review by Green et al found that there was little evidence to support or refute the use of oral NSAIDs for tendinopathy. They did, however, find some support for the use of topical NSAID therapy for lateral elbow pain.

Corticosteroid injections are also used to treat tendinopathies. However, much is not known regarding this therapy, such as optimal drugs, dosages, intervals, and postinjection care. Evidence-based guidelines on the use of local corticosteroid injections for tendinopathies are lacking.

Other therapeutic injections are also being used such as sclerosing polidocanol injections. Sclerosing therapy is thought to work by inhibiting the neovascularization that has been implicated in pain of tendinopathy. No systematic review articles were identified at the time of writing.

Extracorporeal shock wave therapy (ESWT) is an ultrasound-guided therapy that focuses a single-pressure pulse at a specific site. The pulse is of microsecond duration. Extracorporeal shock wave therapy was initially used for urolithiasis but is now also being applied to tendinopathies and enthesopathies. This therapy is reported to stimulate tissue healing and break down calcific deposits.

Various tendinopathies are being treated with ESWT, such as Achilles tendinopathy, calcific shoulder tendinopathy, and noncalcific rotator cuff tendinopathy. Although rare, adverse events have been reported.

In nonresponsive cases, surgery may be considered. Carmont and Maffulli state that surgery is useful when managing the 10% of patients that have not responded to 3 to 6 months of conservative care. Surgical intervention has been used in Achilles tendinopathy, peroneal tenosynovitis, patellar tendinopathy, and rotator cuff tendinopathy.

The National Board of Chiropractic Examiners gathered data regarding chiropractic practice in the United States through surveys performed in 1991, 1998, and 2003. According to the most recent survey, tendonitis is one of the most commonly seen conditions among chiropractors; and chiropractors report that they commonly treat this condition without the need for medical co-management. Christensen and Delle Morgan report that chiropractors routinely care for patients with tendonitis using a variety of interventions including joint manipulation, cryotherapy, bracing/orthotics, massage, electrical stimulation, acupuncture-type procedures, and therapeutic exercise.

The Council on Chiropractic Guidelines and Practice Parameters was charged by the Congress of Chiropractic State Associations to create a chiropractic “best practices” document and to examine all existing guidelines and related documents to develop such a document. To accomplish this, the Scientific Commission of the Council on Chiropractic Guidelines and Practice Parameters was charged to develop literature syntheses on topics relevant to chiropractic practice.

This document was undertaken as part of the literature synthesis for soft tissue conditions. The purpose of this article is to review interventions commonly used by chiropractors when treating tendinopathic conditions.

**Methods**

Relevant literature was located by a search of electronic, online databases performed by the authors. The inclusion criteria were manual therapies, spinal manipulation, mobilization, tendonitis, tendinopathy, tendinosis, cryotherapy, bracing, orthotics, massage, friction massage, transverse friction massage, electrical stimulation, acupuncture, exercise, eccentric exercise, laser, and ultrasound (therapeutic). English-language literature from 1970 to 2008 involving human subjects was included. This search was conducted in the PubMed; Cumulative Index to Nursing and Allied Health Literature; Index to Chiropractic Literature; Manual, Alternative, and Natural Therapy Index System; National Guidelines Clearinghouse, Database of Abstracts of Reviews of Effects; and Turning Research Into Practice databases. Acupuncture, topical NSAIDs, corticosteroid injections, and ESWT were also included in the search. Acupuncture was included because some jurisdictions in North America permit the use of various types of acupuncture procedures within the chiropractic scope of practice. In regard to ESWT and NSAIDs, although chiropractors do not perform the interventions or prescribe drugs, it is important to be familiar with the literature regarding their use because they may need to refer or co-manage patients using or considering these or other medical interventions.

After the primary search was conducted, a number of secondary searches were performed based upon “related links,” especially emphasizing systematic or clinical reviews, randomized clinical trials (RCTs), and chiropractic treatments, as well as searches of additional works by the authors identified in the primary search. After completion of the literature review, 2 of the authors (MP, SC) independently graded the interventions and then developed a consensus table with grades and recommendations for
**Fig 1. Summary of recommendations for tendinopathy.**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Rating</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulation/mobilization</td>
<td>C</td>
<td>There is limited evidence to support the use of manipulation and mobilization in providing relief of tendinopathy. The intervention is recommended for appropriate patients. No systematic reviews were identified.</td>
</tr>
<tr>
<td>Cryotherapy</td>
<td>I</td>
<td>The intervention is recommended for appropriate patients and has nominal costs and low potential for harm.</td>
</tr>
<tr>
<td>Bracing/orthotics</td>
<td>I</td>
<td>The intervention is recommended for appropriate patients.</td>
</tr>
<tr>
<td>Massage/friction massage</td>
<td>C</td>
<td>There is limited evidence to support the use of friction massage in providing relief of tendinopathy.</td>
</tr>
<tr>
<td>Ultrasound/electrical stimulation</td>
<td></td>
<td>Ultrasound: rating B. Ultrasound is recommended for appropriate patients.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electrical stimulation: rating I. The evidence is insufficient to recommend for or against routinely providing this intervention.</td>
</tr>
<tr>
<td>Acupuncture-type procedures*</td>
<td>C</td>
<td>There is limited evidence to support the use of acupuncture in providing relief for tendinopathy, especially in the area of short-term management of pain.</td>
</tr>
<tr>
<td>Exercise/eccentric exercise</td>
<td>B</td>
<td>There is limited evidence to support the use of eccentric exercise in the treatment of tendinopathy.</td>
</tr>
<tr>
<td>Laser</td>
<td>I</td>
<td>There is insufficient evidence to recommend for or against routinely providing this intervention for treatment of tendinopathy.</td>
</tr>
<tr>
<td>ESWT*</td>
<td>I</td>
<td>There is insufficient evidence to recommend for or against routinely providing this intervention for treatment of tendinopathy. Should not be used as a first-line approach. There is limited evidence to support the use of high-energy ESWT in calcific rotator cuff tendinopathy.</td>
</tr>
<tr>
<td>Surgery*</td>
<td>C</td>
<td>There is limited evidence to support the use of surgery for treatment of tendinopathy in carefully selected patients (after patient has attempted a reasonable trial of conservative therapy). Should not be used as a first-line approach. No systematic reviews were identified.</td>
</tr>
<tr>
<td>Topical NSAIDs</td>
<td>C</td>
<td>There is limited evidence to support the use of topical NSAIDs in the treatment of tendinopathy.</td>
</tr>
<tr>
<td>Corticosteroid injections</td>
<td>I</td>
<td>There is insufficient evidence to recommend for or against routinely providing this intervention for treatment of tendinopathy. There is concern related to long-term effects of this intervention, although this intervention may provide acute pain relief.</td>
</tr>
</tbody>
</table>

**Fig 1. (continued)**

**RESULTS**

**Systematic Reviews/Meta-Analyses**

Our search identified 4 systematic reviews related directly to conservative treatment interventions for tendinopathy and 4 systematic reviews related to general topics that include conservative interventions for tendinopathy. One systematic review on acupuncture for treatment of lateral shoulder pain was identified, and 3 reviews (1 a meta-analysis) were found evaluating the effectiveness of corticosteroid injections. One systematic review/meta-analysis and 1 systematic review are described below discussing the effects of topical NSAIDs for pain and chronic musculoskeletal pain. One systematic review was identified that explored the effectiveness of ESWT in patients with calcific tendinitis of the rotator cuff.

Brosseau et al. reviewed friction massage for treating tendonitis. Deep tissue friction massage combined with other physiotherapy modalities did not show consistent benefit in the control of pain, or improvement of grip strength and functional status for patients with iliotibial band syndrome or for patients with extensor carpi radialis tendinopathy within 2 randomized controlled trials reviewed.

Kingma et al. reviewed eccentric overload training in patients with chronic Achilles tendinopathy. Nine clinical trials were included, but only 1 study was considered to have sufficient methodological quality. The authors concluded...
that, although the effects of eccentric exercise on Achilles tendinopathy are promising, no definite conclusions could be drawn.

Woodley et al\textsuperscript{57} reviewed the effectiveness of eccentric exercise in the treatment of chronic tendinopathy. In this review, 11 clinical trials met the inclusion criteria; and it was concluded that limited levels of evidence exist to suggest that eccentric training has a positive effect on clinical outcomes such as pain, function, and patient satisfaction/return to work when compared with various control interventions such as concentric exercise, stretching, splinting, frictions, and ultrasound. Wasielewski and Kotsko\textsuperscript{58} reviewed the effects of eccentric exercise in physically active adults with lower extremity tendinopathy. The mean Physiotherapy Evidence Database score for the 11 studies selected for review was 5.3/10, with a range of 4 to 7. The authors comment that these scores are relatively good, considering that the intervention of eccentric exercise does not allow for blinding of the subject or therapist, thus allowing a maximum achievable score of 8/10. Of the 11 selected studies, 7 of the investigators used eccentric exercise exclusively. The remaining trials selected for review combined other therapeutic exercises in conjunction with eccentric exercise, including active warm-up, isotonic concentric/eccentric exercises, and balancing exercises. In addition, 1 group used night splints during the treatment period. The authors’ conclusion was that eccentric exercise may reduce pain and improve strength in lower extremity tendinopathy, but there is uncertainty over whether eccentric exercise is more effective than other forms of exercise for the resolution of tendinopathic symptoms.

Van der Heijden et al\textsuperscript{59} reviewed 20 randomized controlled trials using physiotherapy for soft tissue shoulder disorders. Diagnosis was not exclusive to tendinopathy, although this condition was common among participants and both acute and chronic patients were included within the various trials. Interventions in the reviewed RCTs included ultrasound, thermotherapy, low-level laser, magnetotherapy, manipulation or mobilization, electrotherapy, cold therapy, and exercise therapy. The authors point out that small sample sizes and unsatisfactory methods of many trials hamper firm conclusions on effectiveness of treatment. Based upon this review, when compared with placebo and another treatment, ultrasound therapy was ineffective in patients with shoulder disorders. The authors conclude that evidence is insufficient to support effectiveness of low-level laser therapy, heat or cold treatment, electrotherapy, exercise, and mobilization in such patients. The authors were unable to find any placebo-controlled trial on electrotherapy, and they concluded that transcutaneous electrical stimulation did not seem to be more effective than ultrasound therapy or other electrical methods. No trials reviewed included interventions of mobilization or manipulation in patients diagnosed with tendinopathy.

Green et al\textsuperscript{60} reviewed 26 trials involving the use of physiotherapy interventions for general shoulder pain, excluding trauma and systemic inflammatory diseases. In treatment of “tendinitis,” laser therapy was no more effective than placebo; and ultrasound was of little benefit. In addition, ultrasound was found to be of little benefit over and above exercise alone for tendinitis of the shoulder. The authors report that there is limited evidence that exercise is effective for rotator cuff disease with additional benefits from exercise with mobilization. The authors also found limited evidence that ultrasound was effective for calcific tendinitis. This review identified evidence that supervised exercise is of benefit in the short term and long term for a variety of shoulder pain.

Green et al\textsuperscript{61} included 4 trials in a review to assess the use of acupuncture for lateral elbow pain. Of the included studies, 2 trials compared needle acupuncture with placebo, 1 compared laser acupuncture with placebo, and 1 compared a combination of acupuncture and vitamin B12 injection with vitamin B12 injection alone. Results demonstrated that short-term pain decreases with needle acupuncture, but the authors concluded that there is insufficient evidence to support or refute the use of acupuncture (both needle or laser) in the treatment of lateral elbow pain.

Green et al\textsuperscript{62} reviewed 31 RCTs of common interventions for shoulder pain and, at that time, found little evidence to support or refute the efficacy of common interventions for shoulder pain.

Mason et al\textsuperscript{63} and Moore et al\textsuperscript{64} reviewed use of topical NSAIDs for treatment of acute and chronic musculoskeletal conditions. Looking at data from over 20 clinical trials, Mason et al\textsuperscript{63} concluded that topical NSAIDs were safe and effective in treating chronic musculoskeletal conditions for 2 weeks.

Three review articles were found including a meta-analysis, a systematic review, and a narrative review, all of which evaluated the effectiveness of corticosteroid injection for tendinopathy.\textsuperscript{65-67} Arroll and Goodyear-Smith\textsuperscript{65}
concluded that subacromial injections of corticosteroids are effective for improvement of rotator cuff tendinopathy up to a 9-month period and likely more effective than oral NSAID medication. Assendelft et al.66 concluded that evidence on injections for lateral epicondylitis is not conclusive but that the intervention seems effective in the short term (2-6 weeks). Shrier et al.67 also concluded that there were insufficient data to determine the comparative risks and benefits of corticosteroid injection and cautioned that the decreased tendon strength with intratendinous injections in animal studies suggests that rupture may be a potential complication for several weeks after injection.

Harnihan et al.68 reviewed the effectiveness of ESWT for calcific tendinopathy of the rotator cuff. Extracorporeal shock wave therapy has been suggested as a treatment alternative for tendinopathy after conservative interventions have been attempted but before surgical intervention. Sixteen trials met the authors’ inclusion criteria (5 RCTs) and included both noncalcific and calcific tendinopathy. The authors concluded that better-quality trials are needed, but they found moderate evidence that high-energy ESWT is effective in treating chronic calcific rotator cuff tendinopathy and concluded that there is moderate evidence that low-energy ESWT is not effective for treating chronic noncalcific rotator cuff tendinopathy.

Practice Guidelines

Our search for evidence-based guidelines identified 2 publications of interest related to interventions used in the treatment of tendinopathy:

The Philadelphia Panel of evidence-based clinical practice guidelines69 reviewed interventions used in the treatment of shoulder pain. Therapeutic ultrasound showed clinically important benefit in the treatment of calcific shoulder tendinopathy. For several interventions and indications (eg, thermotherapy, therapeutic exercise, massage, transcutaneous electrical stimulation and other forms of electrical stimulation, mechanical traction, combined rehabilitation approaches), there was lack of evidence regarding efficacy. No recommendations were made for use of manipulation/mobilization or manipulation/mobilization combined with other interventions. This group concluded that well-designed clinical trials are warranted regarding the use of several interventions for patients with shoulder pain where evidence is currently insufficient to make recommendations.

The American College of Occupational and Environmental Medicine recently published a guideline for treatment of elbow disorders.70 Physical treatment methods recommended by this group include ultrasound treatment of epicondylalgia, iontophoresis for epicondylalgia with either glucocorticoid or diclofenac, at-home applications of heat or cold packs for comfort, and acupuncture for epicondylalgia. No recommendations (insufficient evidence based upon consensus panel) were made for the use of manipulation, massage, friction massage, transcutaneous electrical nerve stimulation, soft tissue mobilization, biofeedback, magnets, and diathermy. Physical treatments not recommended include ESWT, low-level laser therapy, and phonophoresis. Other conservative interventions recommended by this group include epidyndyl supports for epicondylalgia, dynamic extensor brace for lateral epicondylalgia, wrist splinting for epicondylalgia, wrist brace for pronator syndrome, exercise instruction for epicondylalgia, physician recommendations for range-of-motion instruction and strengthening exercises in epicondylalgia patients, stretching, aerobic exercise, activity modifications, and workstation modifications. Medical and surgical interventions recommended by this group in treatment of elbow disorders include acetaminophen and aspirin, topical NSAIDs, oral NSAIDs, and surgery after at least 6 months of conservative treatment with failure to show signs of improvement (at least 3 months in unusual cases). Medical interventions not recommended by this group include opioids (other than in acute, severe conditions) and autologous blood injections. Refer to the American College of Occupational and Environmental Medicine guideline for detailed definitions of the strength of evidence ratings.

Conclusion

Chiropractors often provide a number of conservative interventions commonly used to treat tendinopathy. More research is needed to assess combinations of manipulation, mobilization procedures, facilitated stretching, and other interventions because these most closely match current chiropractic practice. The use of instrument-assisted soft tissue mobilization and active/passive release-type procedures is plausible and promising; but clinical trials are needed to assess the effectiveness of these procedures, as there is little evidence to guide the use of these procedures. There is an urgent need for well-designed clinical trials to assess patient-important outcomes, both short term and long term.

Practical Applications

- There is evidence that ultrasound therapy provides clinically important improvement in the treatment of calcific tendonitis.
- There is limited evidence of the benefit of manipulation and mobilization in the treatment of tendinopathy.
- Chiropractors often provide a number of conservative interventions commonly used to treat tendinopathy.

References


**Friction massage/deep transverse friction massage**


**Extracorporeal shock wave therapy**


**Ultrasound (therapeutic)/electrical stimulation**


**Laser/low-level laser**


**Bracing/orthotics**


**Acupuncture**


**Other interventions of interest**


**Randomized Controlled Trials/Clinical Trials**

**Eccentric exercise**


Frohm A, Saartok T, Halvorsen K, Renstrom P. Eccentric treatment for patellar tendinopathy: a prospective rando-


Laser


Ultrasound


Acupuncture


Orthotics


Case Reports


**CHIROPRACTIC TREATMENT**


