LITERATURE SYNTHESIS:
CHIROPRACTIC MANAGEMENT OF TENDINOPATHY

*A literature synthesis is an academically rigorous analysis of all the available scientific literature on a specific topic. Reviewers use internationally accepted tools to rate each article according to specific criteria. These include the type of study (randomized controlled trial, case series, etc), the quality of the study, size of the study and many other factors which influence the credibility and strength of the study's conclusions. Each reviewer independently rates all the available articles, and the ratings are compared among the members of the review team. When there is disagreement among the reviewers regarding the conclusions, a formal consensus process is followed to arrive at an overall conclusion upon which all reviewers can agree. The resulting conclusions do not represent the reviewers’ own beliefs but rather what the literature actually supports. A literature synthesis is a starting point. It indicates only what we can conclude with supportable, scientific evidence. Appropriate therapeutic approaches will consider the literature synthesis as well as clinical experience, coupled with patient preferences in determining the most appropriate course of care for a specific patient.

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### Summary of Recommendations

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<th>Conclusion and Strength of Evidence Rating</th>
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<tr>
<td><strong>Manipulation / Mobilization</strong></td>
<td>RATING C</td>
</tr>
<tr>
<td></td>
<td>Limited evidence to support manipulation and mobilization for relief of tendinopathy. The intervention is recommended for appropriate patients. No systematic reviews were identified.</td>
</tr>
<tr>
<td><strong>Cryotherapy</strong></td>
<td>RATING I</td>
</tr>
<tr>
<td></td>
<td>Although evidence of effectiveness is insufficient, the intervention is recommended for appropriate patients because of its nominal costs and low potential for harm.</td>
</tr>
<tr>
<td><strong>Bracing / Orthotics</strong></td>
<td>RATING I</td>
</tr>
<tr>
<td></td>
<td>Although evidence of effectiveness is insufficient, the intervention is recommended for appropriate patients because of its low potential for harm.</td>
</tr>
<tr>
<td><strong>Massage / Friction massage</strong></td>
<td>RATING C</td>
</tr>
<tr>
<td></td>
<td>There is limited evidence to support the use of friction massage in providing relief of tendinopathy.</td>
</tr>
<tr>
<td><strong>Ultrasound / Electrical stimulation</strong></td>
<td>Ultrasound: RATING B</td>
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<tr>
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<td>Ultrasound is recommended for appropriate patients.</td>
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<td><strong>Acupuncture type procedures</strong></td>
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<td></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>
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<td><strong>Exercise / Eccentric exercise</strong></td>
<td>RATING B</td>
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<tr>
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<td>There is fair evidence to support the use of eccentric exercise in the treatment of tendinopathy.</td>
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<td>There is insufficient evidence to recommend for or against routinely providing this intervention.</td>
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<td><strong>Extracorporeal shockwave (ESWT) therapy</strong></td>
<td>RATING I</td>
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<tr>
<td></td>
<td>There is insufficient evidence to recommend for or against routinely providing this intervention. It should not be used as first-line approach. There is limited evidence to support the use of high-energy ESWT in calcific rotator cuff tendinopathy.</td>
</tr>
<tr>
<td><strong>Surgery</strong></td>
<td>Rating C</td>
</tr>
<tr>
<td></td>
<td>There is limited evidence to support the use of surgery in carefully selected patients (after patient has attempted a reasonable trial of conservative therapy). Should not be used as a first-line approach.</td>
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<tr>
<td><strong>Topical NSAIDs</strong></td>
<td>RATING C</td>
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<tr>
<td></td>
<td>There is limited evidence to support the use of topical NSAIDs.</td>
</tr>
<tr>
<td><strong>Corticosteroid injections</strong></td>
<td>RATING I</td>
</tr>
<tr>
<td></td>
<td>There is insufficient evidence to recommend for or against routinely providing this intervention. There is concern related to long-term effects although this intervention may provide acute pain relief.</td>
</tr>
</tbody>
</table>
Introduction

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 as 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 aetiological implication (3, 4).

Some common tendinopathies include rotator cuff (primarily supraspinatus) tendinopathy, calcaneal or Achilles tendonopathy, 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 colli (5) retropharyngeal prevertebral musculature (6), iliopsoas (7), quadratus femoris (8), popliteus (9), and the pes anserine (10).

Illness Burden

These common tendon disorders place significant 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 work-related musculoskeletal disorders (WRMD), which include tendinopathies, were associated with increased time away from work (13). The average lost time days for “tendonitis” has increased from 11 days in 2003 to 14 in 2006 (13). Bonde et al. reported the duration of shoulder tendinopathy disability in Danish industrial service workers to be in the order of 10 months for 50% of sufferers (14). In a Canadian study, Yassi and coworkers (15) found that the most frequent upper limb diagnosis submitted to the worker’s compensation board was “tendonitis”. They go on to report that claimants had symptoms an average of 8 months prior to reporting the injury (15).

Chronic disability is associated with higher healthcare and societal costs. Baldwin and Butler examined the costs and outcomes after the initial return to work of an injured worker (16). They found a substantial proportion (26%) of workers with cumulative trauma disorders, such as tendinopathies, experienced further injury-related absences following the initial return to work (16). 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 (17). The tendon matrix consists primarily of type I collagen, proteoglycans and glycoproteins. Although type I collagen is predominant, other collagens may also be present, however 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 (18).

Tenocytes are fibroblast-like cells within the tendon and are responsible for tissue maintenance and matrix remodeling (17). The structure of individual tendons is determined by tenocyte metabolism, which in turn may be influenced by factors such as biomechanical loading (19).

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 coworkers (20) found four diagnostic morphological changes in rat supraspinatus tendinopathy. Those changes were fibroblastic alterations (hyper- or hypocellularity), increased glycosaminoglycan (GAG) staining, collagen disorganization or disarray, and hypervasularity (20). Supporting the hypothesis that tendinopathy in not inflammatory, they found no extrinsic cellular invasion in the tendinopathic rats (20). They also found no evidence of apoptosis in the tendinopathy group.

Tenocyte morphology also changed. Following repetitive loading, the tenocytes appeared to have a rounded chondrocytic appearance (20). Other authors support this observation (11, 21). Furthermore, they suggest tenocyte proliferation may be caused by an insulin-like growth factor 1 (IGF-1) autocrine signaling response (20).

Other tendinous changes have been noted. These changes include hypervasularity (22), tendinous microtears (23), increased type III collagen, fibronectin, tenascin-C, and matrix GAG’s (24), increased expression of chondroitin sulfate proteoglycans, aggrecan, and biglycans (25), 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 (26). Metalloproteinase enzymes have been implicated, at least in part, in the cell-mediated changes seen in tendinopathy (24).

**Risk Factors**

Biomechanical risk factors have been extensively studied. Tendons are suited to sustaining great tensile loads (18). 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 (25). Repetition and forceful exertion have also been implicated as causal factors in the development of tendinopathies (11, 20, 27, 28, 29).

Personal risk factors include advancing age and obesity. Increasing age has been associated with increased risk of developing tendinopathy and delayed recovery (14, 27). Frey and Zamora (30) found 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 (31, 32). Type V collagen fibre assembly and diameter is associated with the COL5A1 gene (31,32). The TNC gene encodes for tenascin-C, which is important in regulating the tendons response to a mechanical load (31, 32).
Although biomechanical and histological analyses have helped shed light on the aetiopathogenesis of tendinopathy, disability due to this condition appears to be complex and multifactorial. Leclerc and coworkers found psychosomatic problems and social support at work were predictive of wrist “tendinitis” (33). They also found previous upper-limb disorders and depressive symptoms predicted a first occurrence of lateral epicondylitis (33). Other studies support the key role of psychosocial factors in tendinopathy severity and disability (34, 35, 36). 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 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 following activity or even at rest.

Provocative palpation of the tendon tends to recreate the patients 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 (MRI) or ultrasound, do not correlate well with clinical symptoms (37). As such these imaging modalities should be used if the diagnosis remains unclear following a thorough history and examination.

**Therapeutic Interventions**

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

Non-steroidal 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 and coworkers found there was little evidence to support or refute the use of oral NSAIDs for tendinopathy (38). They did, however, find some support for the use of topical NSAID therapy for lateral elbow pain (38).

Corticosteroid injections are also used to treat tendinopathies. However, much is not known regarding this therapy, such as optimal drugs, dosages, intervals, and post injection care (39). Evidence-based guidelines on the use of local corticosteroid injections for tendinopathies are lacking (39).

Other therapeutic injections are also being used such as sclerosing polidocanol injections (40, 41). Sclerosing therapy is thought to work by inhibiting the neovascularisation that has been implicated in pain of tendinopathy (40). 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. ESWT was initially used for urolithiasis but is now also being applied to tendinopathies and enthesopathies. This therapy is reported to stimulate tissue healing and breakdown calcific deposits (42).

Various tendinopathies are being treated with ESWT, such as Achilles tendinopathy (43), calcific shoulder tendinopathy (44, 45, 46, 47), and non-calcific rotator cuff tendinopathy (48). Although rare, adverse events have been reported (49).

In non-responsive cases surgery may be considered. Carmont and Maffulli (50) state that surgery is the useful when managing the 10% of patients that have not responded to 3-6 months of conservative care. Surgical intervention has been used in Achilles tendinopathy (50), peroneal tenosynovitis (51), patellar tendinopathy (52), and rotator cuff tendinopathy (53).

The National Board of Chiropractic Examiners (NBCE) has gathered data regarding chiropractic practice in the U.S. 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 (1). Christensen(1) reports 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 (CCGPP) was charged by the Congress of Chiropractic State Associations (COCSA) to create a chiropractic "best practices" document and to examine all existing guidelines, and related documents in order to develop such a document. In order to accomplish this, the Scientific Commission of CCGPP 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 database searches 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 Medline, CINAHL, Index to Chiropractic Literature (ICL), MANTIS, the National Guidelines Clearinghouse, DARE and TRIP databases. Acupuncture, topical non-steroidal anti-inflammatory drugs (NSAIDs), corticosteroid injections and extracorporeal shockwave (ESWT) therapy 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 literature regarding their use as 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, chiropractic treatments as well as searches of additional works by the authors identified in the primary search. After completion of the literature review, two of the authors (MP; SC) independently graded the interventions and then developed a consensus table with grades and recommendations for each intervention (Summary of Recommendations). Table 1 describes the grading system used. Systematic reviews and meta-analysis articles found are described below. Randomized controlled trials, clinical trials and case studies of interest are listed in Appendix A. Instruments developed by the Scottish Intercollegiate Guidelines Network (SIGN) were used to evaluate RCTs and systematic reviews (54).

Table 1. Definitions of grading categories.

| RATING A: Good evidence from relevant studies. |
|______________________________________________|
| Studies with appropriate designs and sufficient strength, with clinically important and consistent results. |

| RATING B: Fair evidence from relevant studies. |
|______________________________________________|
| Studies of appropriate designs of sufficient strength, but with minor inconsistencies, generalizability or design flaws; or evidence from weaker designs. |

| RATING C: Limited evidence from studies/reviews. |
|______________________________________________|
| Studies with substantial uncertainty due to design flaws, or adequacy of sample size. |

| RATING I: No recommendation can be made because of insufficient or non-relevant evidence. |
Results

Literature search results: Systematic Reviews / Meta-analyses

Our search identified four systematic reviews related directly to conservative treatment interventions for tendinopathy and four systematic reviews related to general topics which include conservative interventions for tendinopathy. One systematic review on acupuncture for treatment of lateral shoulder pain was identified and three reviews (one a meta-analysis) were found evaluating the effectiveness of corticosteroid injections. One systematic review/meta-analysis and one systematic review are described below discussing the effects of topical NSAIDs for pain and chronic musculoskeletal pain. One systematic review was identified which explored the effectiveness of extracorporeal shock wave therapy in patients with calcific tendonitis of the rotator cuff.

Brosseau(55) 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 tendonitis within two randomized, controlled trials reviewed.

Kingma et al (56) reviewed eccentric overload training in patients with chronic Achilles tendinopathy. Nine clinical trials were included but only one study was considered to have sufficient methodological quality. The author concluded that although the effects of eccentric exercise on Achilles tendinopathy are promising, no definite conclusions could be drawn.

Woodley et al (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 to various control interventions such as concentric exercise, stretching, splinting, frictions and ultrasound.

Wasielewski and Kotsko(58) reviewed the effects of eccentric exercise in physically active adults with lower extremity tendinopathy. The mean PEDro 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. Additionally 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 (59) reviewed 20 randomized controlled trials employing 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 (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. Additionally ultrasound was found to be of little benefit over and above exercise alone for tendonitis 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 tendonitis. This review identified evidence that supervised exercise is of benefit in the short term and long term for a variety of shoulder pain.

Green and coworkers included four trials in a review to assess the use of acupuncture for lateral elbow pain (61). Of the included studies two trials compared needle acupuncture to placebo, one compared laser acupuncture to placebo, and one compared a combination of acupuncture and vitamin B12 injection to vitamin B12 injection alone. Results demonstrated short-term pain decrease 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 and associates (62) reviewed thirty one 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 (63) and Moore (64) reviewed use of topical NSAIDs for treatment of acute and chronic musculoskeletal conditions. Looking at data from
over twenty clinical trials Mason (63) concluded that topical NSAIDs were safe and effective in treating chronic musculoskeletal conditions for two 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 (65, 66, 67). Arroll and Goodyear-Smith (65) concluded that subacromial injections of corticosteroids are effective for improvement of rotator cuff tendinopathy up to a nine-month period and likely more effective than oral NSAID medication. Assendelft (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 was 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 following injection.

Harnihan et al (68) reviewed the effectiveness of extracorporeal shock wave therapy (ESWT) for calcific tendinopathy of the rotator cuff. ESWT has been suggested as a treatment alternative for tendinopathy after conservative interventions have been attempted but prior to surgical intervention. Sixteen trials met the authors’ inclusion criteria (five 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.

Literature search results: Practice Guidelines

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

- The Philadelphia Panel of evidence-based clinical practice guidelines (69) reviewed interventions used in the treatment of shoulder pain. Therapeutic ultrasound showed clinically important benefit in treatment of calcific shoulder tendinopathy. For several interventions and indications (e.g. 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 (ACOEM) recently published a guideline for treatment of elbow disorders (71). Physical treatment methods recommended by this group include ultrasound treatment for 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, TENS, 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 epicondyle 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 six 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 ACOEM guideline for detailed definitions of the strength of evidence ratings.

**Conclusion**

Chiropractors often provide a number of conservative interventions commonly used to treat tendinopathy. Much more research is needed to assess combinations of manipulation, mobilization procedures, facilitated stretching and other interventions as this most closely matches current chiropractic practice. The use of instrument assisted soft tissue mobilization and active/passive release type procedures are plausible and promising but clinical trials are needed to assess 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.
References


industrial and service workers. Occup Environ Med 2003;60:e8 (http://www.occenvmed.com/cgi/content/full/60/9/e8)


27. Bernard BP. Musculoskeletal disorders and workplace factors: a critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck,


53. Taverna E, Battistella F, Sansone V, Perfetti C, Tasto JP. Radiofrequency-based plasma microtenotomy compared with arthroscopic subacromial...


Appendix A

Review Articles

Strengthening and stretching


Cryotherapy


Manipulation / Mobilization


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


Laser


Ultrasound


**Cryotherapy**


**Acupuncture**


**Orthotics**


**Case Reports**


**Chiropractic Treatment**


Nowak KN. The effectiveness of combining ankle and pelvic manipulation versus ankle manipulation alone in the management of chronic Achilles tendinitis. WFC’s 7\textsuperscript{th} Biennial congress conference proceedings. 2003:7\textsuperscript{th} Ed. 339-40.


