2014

Effectiveness of Diathermy in Comparison With Ultrasound or Corticosteroids in Patients With Tendinopathy: A Critically Appraised Topic

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Szlosek, Philip A.; Taggart, John; Cavallario, Julie M.; and Hoch, Johanna M., "Effectiveness of Diathermy in Comparison With Ultrasound or Corticosteroids in Patients With Tendinopathy: A Critically Appraised Topic" (2014). *Human Movement Sciences Faculty Publications*. 59.  
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**Original Publication Citation**  

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Effectiveness of Diathermy in Comparison With Ultrasound or Corticosteroids in Patients With Tendinopathy: A Critically Appraised Topic

Philip A. Szlosek, John Taggart, Julie M. Cavallario, and Johanna M. Hoch

Clinical Scenario: Many therapeutic modalities have been used to treat the pain and inflammation commonly associated with tendinopathies. One modality that has been used to treat patients with tendinopathies is diathermy. Focused Clinical Question: Is there evidence to suggest that diathermy is more or equally as effective at reducing pain in patients with tendinopathy when compared with ultrasound or corticosteroid treatments?

Summary of Search, “Best Evidence” Appraised, and Key Findings: The literature was searched for randomized control trials (RCTs) that investigated the effects of diathermy treatments in comparison with ultrasound or corticosteroid treatments on pain in patients with tendinopathy. Three RCTs were selected from the search results and included in this critically appraised topic. Clinical Bottom Line: There is moderate evidence to support that diathermy is more effective at reducing pain in patients with tendinopathy than ultrasound and equally effective as corticosteroid treatments. Strength of Recommendation: There is grade B evidence to support that diathermy is more effective at reducing pain in patients with tendinopathy than ultrasound and equally effective at reducing pain as corticosteroid treatments.

Keywords: hyperthermia, pain, tendonitis

Clinical Scenario

Tendinopathies are common overuse pathologies that affect many people of all ages and activity levels. Many therapeutic modalities have been used to treat the pain and inflammation commonly associated with these conditions such as tendinopathy is diathermy.

Focused Clinical Question

Is there evidence to suggest that diathermy is more or equally as effective at reducing pain in patients with tendinopathy when compared with ultrasound or corticosteroid treatments?

Summary of Search, “Best Evidence” Appraised, and Key Findings

• The literature was searched for randomized control trials (RCTs) that investigated the effects of diathermy treatments in comparison with ultrasound or corticosteroid treatments on pain in patients with tendinopathy.
• The literature search returned 5 possible studies related to the clinical question; 3 RCTs met the inclusion criteria and were included.1,2,3
• Two high-quality RCTs2,3 and 1 low-quality RCT were included.1
• Two studies1,2 demonstrated that diathermy was more effective at reducing pain than ultrasound, and 1 study1 demonstrated that diathermy was equally as effective at reducing pain as corticosteroid treatments.

Clinical Bottom Line

There is moderate evidence to support that diathermy is more effective at reducing pain in patients with tendinopathy than ultrasound treatments1,2 and equally as effective at reducing pain as corticosteroid treatments.3
Diathermy Comparison in Patients with Tendinopathy

Strength of Recommendation: There is grade B evidence to support that diathermy is more effective at reducing pain in patients with tendinopathy than ultrasound and equally effective at reducing pain as corticosteroid treatments. The Centre of Evidence-based Medicine recommends a grade of B for level 2 evidence with consistent findings. Although the studies included in this CAT were RCTs, based on the limitations of the studies, as well as the PEDro score for 1 of the RCTs, we believe that a grade of B is more appropriate.

Best Evidence

The studies included were identified as the best evidence and selected for inclusion in this CAT (Table 2). These studies were selected because they were RCTs that examined a diathermy intervention compared with an ultrasound1,2 or corticosteroid3 intervention and measured pain as a clinical outcome.

Implications for Practice, Education, and Future Research

Diathermy is a thermal modality that uses a microwave power generator to heat tissues at approximately a 4-cm depth while cooling superficial tissues to prevent the likelihood of overheating at lesser tissue depths. A recent review indicated that a 434-MHz wavelength is most effective at deep tissue heating while still maintaining proper skin temperature.4 The review also reported that diathermy is an effective method of treating tendinopathy due to its ability to increase the tissue temperature to 41°C to 45°C, thus increasing blood flow to the area and promoting the healing process.4 This is notably different than the use of corticosteroids, which is a minimally invasive procedure that is used to reduce symptoms associated with tendinopathy but has greater potential for long-term side effects such as cutaneous atrophy, depigmentation, and infection.5 Diathermy also differs from ultrasound, as diathermy is designed to prevent superficial tissue temperature from exceeding 42°C to prevent burns.4 In addition, ultrasound has an effective treatment area of only 2 to 3 times the size of the transducer, whereas diathermy can effectively heat an area up to 400 cm².6

Based on our search, there is limited evidence available that compares the effectiveness of diathermy with that of other treatment options for reducing pain and inflammation associated with tendinopathy. In the studies reviewed for the CAT, diathermy treatments were compared with ultrasound treatment,1,2 exercise protocols,2 and corticosteroid injection treatment.3 Both studies by Giombini et al1,2 compared the effectiveness of diathermy as a treatment for tendinopathy with ultrasound. Those studies revealed that diathermy reduced the participants’ pain levels significantly more than the ultrasound treatment.1,2 In addition to ultrasound, Giombini et al2 also compared the effectiveness of diathermy

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Study design</th>
<th>Number located</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1b</td>
<td>Randomized controlled trial</td>
<td>2</td>
<td>Giombini et al²</td>
</tr>
<tr>
<td>2b</td>
<td>Randomized controlled trial</td>
<td>1</td>
<td>Giombini et al.¹</td>
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</table>
### Table 2  Characteristics of Included Studies

<table>
<thead>
<tr>
<th>Study design</th>
<th>Participants</th>
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<th>Inclusion Criteria</th>
<th>Study design</th>
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<tr>
<td>Giombini et al(^1)</td>
<td>Randomized controlled trial</td>
<td>44 athletes (33 M, 11 F), mean age of 26 ± 4.56 y, with either patellar or Achilles tendinopathy based on clinical history and physician diagnosis. History of all participants included pain initially with activity and later pain with activities of daily living. Duration from onset of symptoms ranged from 6 to 72 wk.</td>
<td>Patients treated with other forms of physical therapy or medication within the last 5 wk, with documented patellofemoral pathology, severe lower-limb malalignment, associated meniscal or capsular-ligamentous injury, calcific tendinopathy, Haglund syndrome, or other systemic diseases involving patellar and Achilles tendinopathies.</td>
<td>92 men and women age 18 y or older with mean ages of 56.6 ± 11.6 y (corticosteroid group) and 59.2 ± 7.1 y (diathermy group). Must have had shoulder pain lasting for at least 3 mo. Diagnosis of rotator-cuff tendinopathy was established by clinical examination and X-ray.</td>
<td>Randomized controlled trial</td>
<td>37 athletes (29 M, 8 F) with a mean age of 26.7 ± 5.8 y with clinical and ultrasonographic diagnosis of supraspinatus tendinopathy in the dominant shoulder (right in 31 patients, left in 6 patients). All patients had gradual onset of shoulder pain that had impaired their sports activities for 3-6 mo before entering the study.</td>
<td>All patients were involved in sports at either the county, regional, national, or international level and participated in training at least 3 times a wk. Patients were asked to abstain from movement that caused pain during the treatment but performed modified training. All patients were secondary or tertiary referrals to specialized sports physicians or orthopedic surgeons. All patients completed nonoperative management including rest and nonsteroidal anti-inflammatory drugs. Patients were included if they met all 3 of the following conditions: (1) impingement with a positive Hawkins sign in internal rotation or impingement in 90° of forward flexion with forced external rotation, (2) pain with supraspinatus muscle testing in the “empty can” position, and (3) ultrasonographic evidence of nonhomogeneous signal intensity without a frank tear in the supraspinatus tendon.</td>
</tr>
</tbody>
</table>
All outcomes were evaluated before treatment and at 4, 12, and 24 wk after the completion of each intervention for all outcomes considered by an investigator blind to participants’ allocation.

The primary outcome measure was the QuickDASH.

A secondary outcome was the Constant-Murley shoulder-outcome score.

Another secondary outcome was a VAS for pain assessment.

Patients were asked to mark the point on a 100-mm line corresponding to the perceived pain intensity, with 0 indicating the absence of pain and 100 representing the most severe pain.
Both the ultrasound and hyperthermia groups had reduced VAS scores for pain pressure and pain on active contraction. Hyperthermia resulted in a better effect of the reduction of the VAS scores for both pain with pressure and pain during active contraction than did ultrasound. Hyperthermia resulted in a significantly better global result, with 77% of hyperthermia cases rating the results of the treatment as either good or excellent, while only 33% of ultrasound treatments rated the same.

Patients in group A (hyperthermia) experienced significantly better pain relief than those in either group B (ultrasound) or group C (stretching). The Constant-Murley scale showed significant improvement in group A between the preintervention and follow-up time periods as compared with group B and group C.

The use of hyperthermia at 434 MHz in the treatment of chronic tendinopathies demonstrates a significant reduction in pain and symptoms as compared with ultrasound.

Level of evidence

- Giombini et al1: 2b
- Giombini et al2: 1b
- Rabini et al3: 1b

Validity score

- Giombini et al1: PEDro 5/10
- Giombini et al2: PEDro 8/10
- Rabini et al3: PEDro 7/10

Conclusion

The use of hyperthermia at 434 MHz in the treatment of supraspinatus tendinopathy is effective at reducing pain.

Global result: Hyperthermia resulted in a significantly better global result, with 77% of hyperthermia cases rating the results of the treatment as either good or excellent, while only 33% of ultrasound treatments rated the same.

The 2 groups did not differ with respect to age, gender, dominant side affected, or symptom duration. Furthermore, baseline values of all outcome measures were comparable between the 2 groups.

Analyses revealed that both treatment groups experienced improvements in disability, shoulder function, and pain compared with baseline, with no differences over time between interventions.

Local hyperthermia and subacromial corticosteroid injections improved shoulder function and pain, and there were no differences between the 2 treatments.

The use of hyperthermia at 434 MHz in the treatment of supraspinatus tendinopathy is effective at reducing pain.

Abbreviations: M, male; F, female.
as a treatment for tendinopathy with an exercise-only group. That study found that diathermy reduced the participants’ pain levels significantly more than the exercise treatment. The study by Rabini et al. revealed there were no significant differences between treatment groups; both the diathermy treatment and corticosteroid treatment significantly improved shoulder function and pain relative to the participants’ baseline scores. Other results indicated that there were no significant differences in QuickDASH scores or Constant-Murley Score for the participants when comparing diathermy with corticosteroids in the treatment of rotator-cuff tendinopathy. The summary of these results would indicate that diathermy is significantly better at reducing pain than ultrasound treatments and equally as effective at reducing pain levels as a corticosteroid injection.

Although the studies show statistically significant results, there are differences between the studies that must be noted. The Giombini et al. 2002 study analyzed the effect of the 2 modalities on patients with Achilles or patellar tendinopathy, whereas the Giombini et al. 2006 study included patients with supraspinatus tendinopathy. Because the tendons vary in length, diameter, and location, it may not be appropriate to assume that the results are related or that the modalities would be as effective on other tendons throughout the body. There was also a difference in ultrasound parameters between the 2 studies. In the 2002 study, researchers used a frequency of 3.2 MHz, and in the 2006 study, researchers used a 2.0-MHz frequency. The frequency of an ultrasound treatment is inversely related to the depth of penetration of the sound waves. Therefore, a frequency of 3 MHz will penetrate the targeted tissue much more superficially than a frequency of 1 MHz. The variation of ultrasound parameters does make it challenging to compare results across the studies. Finally, there were age differences for the participants who were included in these studies. The subjects who participated in the Rabini study were older than those in either of the Giombini studies (Table 2), therefore potentially making direct comparisons with a young, athletic population more difficult.

We conclude that a level B recommendation can be made that diathermy is more effective at reducing pain in patients with tendinopathy than ultrasound treatments and equally effective as corticosteroid treatments. This level of recommendation was made because all of the studies appraised were RCTs of level 2 evidence or higher with consistent findings. Based on the limitations of 1 of the studies, as well as the PEDro score for 1 of the RCTs, we believe that a grade B is appropriate. While the results of this CAT demonstrate that diathermy is a treatment option for patients with tendinopathy, we believe that it is crucial to continue to use other methods of rehabilitation including stretching and therapeutic exercise to properly restore range of motion or strength for these patients.

Future research is needed to investigate the effects of diathermy on other clinical outcomes associated with tendinopathy, including gains in range of motion and muscle strength in addition to pain levels. Future researchers should also analyze the effects of diathermy on a focused patient population or more specific tendinopathy and include long-term prospective studies with a larger subject pool. In addition, future research should determine the appropriate ultrasound parameter based on desired depth of penetration to allow for better comparison of results. Finally, future studies should address the blinding of patients and treating clinicians in their methodology to strengthen the resulting outcome recommendations. This CAT should be reviewed in 2 years or when additional best evidence becomes available to determine whether additional information has been published that may change the clinical bottom line for the research question posed in this review.

References