Faculty Publications

2014-10-14

Tendinopathy: Setting the Record Straight

Craig Nuttall

Brigham Young University - Provo, craig-nuttall@byu.edu

Ryan Rasmussen

Brigham Young University - Provo

Follow this and additional works at: <https://scholarsarchive.byu.edu/facpub>

Part of the [Other Nursing Commons](#)

Original Publication Citation

Nuttall, C., & Rasmussen, R. J. (2014). Tendinopathy: Setting the Record Straight. *Journal for Nurse Practitioners*, 10(9), 694-699.

BYU ScholarsArchive Citation

Nuttall, Craig and Rasmussen, Ryan, "Tendinopathy: Setting the Record Straight" (2014). *Faculty Publications*. 5083.

<https://scholarsarchive.byu.edu/facpub/5083>

This Peer-Reviewed Article is brought to you for free and open access by BYU ScholarsArchive. It has been accepted for inclusion in Faculty Publications by an authorized administrator of BYU ScholarsArchive. For more information, please contact ellen_amatangelo@byu.edu.

Tendinopathy: Setting the Record Straight

Craig Nuttall, MSN, FNP-C, and Ryan Rasmussen, MS, FNP-C

ABSTRACT

Tendinopathy is a commonly diagnosed injury. Traditionally, tendinopathy was considered to be caused by an inflammatory process. It is now known that a majority of tendinopathies are caused by tendinosis, a failed healing response resulting in a degenerated tendon. The recurrent nature of tendinopathies can present a challenge for the health care provider and be very frustrating for the patient. There are several principles that should be followed when treating tendinopathies. These principles include rest, ice, eccentric exercises, and avoidance of corticosteroid injections. Proper treatment of tendinopathies can lead to optimal healing and decrease the risk of recurrence.

Keywords: assessment, tendinitis, tendinopathy, tendinosis, treatment

© 2014 Elsevier, Inc. All rights reserved.

Until recently, tendinitis was recognized by decreased strength, pain, and inflammation of a tendon caused by repetitive activities. It is now known that tendonitis is not a major cause of tendinopathy.¹ Most of what has been called tendonitis is actually a result of tendinosis.

Tendinosis is a failed healing response characterized by haphazard proliferation of the tenocytes, degeneration of the tendon, neovascularization, and an increased noncollagenous matrix.^{2,3} In other words, the tendon has become thicker, shows signs of degeneration, and is more susceptible to damage.² Another feature of tendinosis is that with microscopic examination of the tendon there is an absence of inflammatory cells.⁴ This indicates that inflammation is not the major cause of the dysfunction of the tendon, but rather a failed healing response is to blame.

By contrast, tendinitis is considered a condition of the tendon involving inflammation of the tendon itself. The word inflammation implies that white blood cells are present in the tendon. This inflammation was thought to be the cause of symptoms of tendinopathy, including pain and weakness. Histologic studies do not support this school of thought.

In the past, it was thought that tendonitis caused a majority of the cases of tendinopathy. This is evidenced in our current nomenclature for tendinopathy. Commonly, we call Achilles tendinopathy

Achilles tendinitis and patellar tendinopathy patellar tendinitis. Another example of this is lateral epicondylitis, which is actually a tendinosis of the extensor carpi radialis.⁴ Current terminology implies an inflammatory process as the cause of the signs and symptoms of tendinopathy. Even when tendonitis was first used to describe pain and dysfunction of the tendon, there was little evidence to support that inflammation was the cause.¹ Current evidence further negates an inflammatory process as the cause of tendinopathy. Although new evidence is mounting about our understanding of tendinopathy, the misconceptions and confusion continues to be widespread among health care providers.

Knowing that tendinopathy is not an inflammatory process has started a conversation about its treatment. Traditionally, anti-inflammatory medications, including nonsteroidal anti-inflammatory drugs (NSAIDs) and corticosteroids, have been a mainstay in the arsenal of treatments for these conditions. Rest, ice, and immobilization have also been commonly used modalities for conservative treatment. Recent research has called into question our current treatment philosophy.⁵

The misconceptions of tendinopathies present a challenge for the health care practitioners treating tendinopathies today. Better knowledge of tendinopathies will lead health care providers to be able to provide appropriate care for the appropriate

condition. This can then lead to improved patient outcomes. The purpose of this article is to provide current evidence available on tendinopathy, including assessment, testing, and appropriate treatments. This article is not designed to cover each specific tendinopathy in detail but will provide the health care provider with a general guiding set of principles to help improve the treatment of tendinopathies.

TENDINOPATHY

Pathophysiology

Although some information on the pathogenesis of tendinopathy has come forth, there is still much that is currently not well understood. The initial injury in a majority of cases of tendinopathy results from a combination of repetitive motion and overuse.^{6,7} Traditional examples of activities that cause tendinopathy are tennis, golf, and endurance sports.⁶ Although we often think of sports as the only cause of tendinopathy, there are many other activities that contribute to the development of tendinopathy. Previous research has identified a combination of factors that increase the likelihood of and play some part in the pathogenesis of tendinopathy. Some of these contributing factors include excess loads on the body, environmental conditions, poor mechanics, misalignments, leg length discrepancy, muscle weakness, obesity, decreased flexibility, and certain disease states.^{2,6} Repetitive motion and overuse combined with other contributing factors can lead to a poor healing response and microtrauma of the tendon. These microtraumas then lead to weakening of the collagen fibers, cross-linking and disrupting other normal structures of the tendon.^{3,6} This results in a weaker tendon that is more vulnerable to recurrent injury. If the causative environment is not reversed or corrected, the repetitive injuries and stress placed on the tendon continue to prevent proper healing of the tendon.⁶⁻⁹ This failed healing response leaves a thicker tendon that is less structured when compared with the original tendon.^{4,6,9,10} The resulting structure is a weaker tendon that continues to be prone to injury. This explains the recurrent nature of tendinopathies in general.

History

As with many acute and chronic injuries, patient history is essential to the diagnosis of tendinopathies. The history cannot only help in the diagnosis of tendinopathy but can also aid in its management.

When initially presenting to the health care setting, a majority of patients will be unable to identify a precipitating event⁶ but may be able to identify patterns of pain. Usually what is described is a gradually progressing localized pain. The pain increases until the irritation from the injured tendon becomes debilitating.⁶ Commonly, the injury has been chronic in nature, lasting several weeks to months, and during this time there are episodes of exacerbation and improvement.^{6,11} This is consistent with the failed healing and reinjury cycle discussed previously. People who are usually affected by tendinopathy are active people engaging in sports or other activities. It is usually more common in females compared with males and increases in incidence with increased age.^{2,12} The pain associated with tendinopathy is worse with the initiation of activity. Tendinopathy pain is commonly more intense in the morning right after getting out of bed and is typically described as stiffness.⁶ Once the muscles are warmed up, the pain usually improves, at least to some degree.⁶ Another important step in the history is to ask about activity that increases the pain.⁶

An important element of your patient's history is determining which activities precipitate the pain. This can help identify the motions that are contributing to the pathogenesis of tendinopathy.

Physical Examination

Physical examination should include inspection, palpation, and active and passive range of motion. Although physical examination is usually focused on the extremity associated with the pain and disability, it is important to consider that other disease states and conditions can contribute to the development of tendinopathy, and a thorough physical examination may be warranted.

In cases of tendinopathy, inspection involves visualizing the patient's movement of the injured extremity, assessing for deformity or misalignments that may contribute to the genesis of the tendinopathy.

Inspection may also reveal bruising, swelling, or edema of the adjacent tissues.⁶ During this phase of the assessment, it is important to also study the mechanics of motion of the extremity.

Palpation is an important diagnostic tool when considering tendinopathy as a cause of pain. Palpation should be incorporated in every physical examination when suspecting tendinopathy.¹³ In a majority of patients with tendinopathy, palpation will elicit tenderness over the affected tendon. Usually, this tenderness will be near the site of insertion of the tendon but may also be in the midsection of the tendon. Tenderness with palpation, especially when pain is moderate to severe with palpation, is a good indicator of tendinopathy and correlates well with ultrasound findings of tendinopathy.

Range of motion and flexibility should always be included in the musculoskeletal examination. Restrictions in flexibility and range of motion have been associated with increased rates of tendinopathy.^{2,6,11} Restrictions in range of motion and flexibility can indicate tension of the surrounding muscle groups.⁶ Active and passive range of motion helps the examiner determine the origin of the pain and differentiate the source of the pain.

DIAGNOSTIC TESTING

Imaging has not played a major role in the diagnosis of tendinopathy historically. For many years, x-ray was the only method implemented in the diagnostic process of tendinopathy. It was primarily used to rule out any bony abnormality. More recently, magnetic resonance imaging (MRI) has been used for the evaluation of soft tissue injuries.⁶ Although MRI is efficient in the evaluation of soft tissue disorders, including tendinopathy, cost and time are limiting factors that affect the use of this imaging technology.

Recently, the emergence of new ultrasonographic techniques has improved our ability to use imaging as a tool in the diagnosis of tendinopathy. Evidence supports that ultrasound can be an effective imaging modality for detecting and diagnosing tendinopathy.¹⁴ Ultrasonography is very accurate in diagnosing full and partial tears of the tendon and also moderately effective in diagnosing tendinopathy alone.¹⁵ Ultrasound can be used to assess tendinopathy at any time but is an especially useful tool when evaluating

the recalcitrant tendinopathy.¹⁴ Ultrasound provides a good first-line imaging tool to be considered before MRI because of cost-effectiveness and convenience.

TREATMENT

Treatment of tendinopathy continues to be a controversial topic.⁵ Several modalities of treatment for tendinopathy have been proposed and incorporated over the years, including nonsurgical and surgical interventions. Depending on the location of the tendinopathy, different modalities of treatment may be more effective than others. The purpose of this article is not to determine the best treatment for each specific tendinopathy but rather to give a general picture of current evidence regarding nonsurgical or conservative treatment and to provide the health care practitioner with a guiding set of principles to use in the treatment of tendinopathy. Surgical interventions for tendinopathy remain an important modality of treatment for tendinopathy but only after conservative treatment has failed. The focus of this article is on conservative interventions for tendinopathy. Surgical interventions will not be discussed in detail.

Conservative Treatment

Conservative treatment or nonsurgical management of tendinopathies continues to be the preferred and most widely used form of initial treatment for tendinopathy.⁵ Conservative treatment can be effective for treating tendinopathy and should be used before surgical interventions are considered.⁵ Conservative treatment of tendinopathy has traditionally included rest, ice, and immobilization. For the purposes of this article, conservative treatment is defined as any nonsurgical treatment.

There is still not a general consensus of a single modality of treatment for tendinopathy that is proven to be superior to others.¹⁶ Many interventions have proven to be beneficial, whereas others have been determined to be useless or even detrimental in the treatment of tendinopathy. Most studies report that a combination of modalities provides the most effective treatment.^{5,17} Because of the wide variety of interventions, prescribing an effective treatment plan can become confusing. There are several principles that should be applied to every case of tendinopathy.

Rest It

Rest of the tendon should be one of the first interventions implemented in the treatment of tendinopathy. Rest is often interpreted as complete avoidance of physical activity. Current practice has started to modify our views of rest in the treatment of tendinopathy. Instead of limiting all activity, rest now involves modification of activity to decrease the amount of strain that is placed on the problematic tendon.^{5,18} Early rehabilitation is also a more frequent choice of treatment.⁵ As stated previously, tendinopathies are caused from repetitive motions and possibly poor mechanics in those motions. Resting the tendon should include modifying those repetitive motions to put decreased strain on the tendon and allow for appropriate healing time. Rest should be used to treat tendinopathies, but this does not mean avoidance of all activities. Rest should instead mean modification of activities to break the cycle of injury.

Ice It

Ice or cryotherapy has been traditionally used to decrease blood flow and swelling to the affected area. It has long been known that applying ice to a painful tendon can decrease pain and swelling. Because of the analgesic affects, ice has been widely incorporated.⁵ Recently, we have come to understand that cryotherapy also helps maintain oxygen saturation of the tendon by decreasing capillary blood flow. This may be beneficial in the healing process. Cryotherapy should be incorporated into the treatment of tendinopathy, especially in the initial stages of treatment.

Exercise It

Early rehabilitation can improve outcomes in tendinopathy.¹⁹ Exercise is one of the most common interventions for treatment of tendinopathy. It should be incorporated early in the treatment plan.⁶ Exercise should be used in conjunction with rest of the tendon. Although it seems that the 2 contradict each other, they actually work in concert together to promote healing. Rest involves limiting the repetitive motion that caused the injury, and exercise would then add motions that strengthen the tendon instead

of weaken it. Exercise with a focus on eccentric exercises has been proven to be the most beneficial form of exercise in the treatment of tendinopathy.^{5,19,20} Eccentric exercises are known as negative movement exercises that consist of elongation of the tendon and then loading the tendon. This motion is repeated in several sets a couple of times a day and is usually done over 12 weeks or more.^{5,6,21} An example of an eccentric exercise is lowering a dumbbell slowly after a biceps curl or lowering your body slowly after a pull-up and not allowing gravity to do all the work. Eccentric training can reverse some of the failed healing response, including neovascularization, and can strengthen the tendon.^{7,22} These exercises are especially beneficial in lower leg tendinopathy in which eccentric exercises are easier to incorporate. An example of eccentric exercises for Achilles tendinopathy would include having patients stand on a stair on their tiptoes and then have them slowly lower their heels below the stair. Although these exercises can be effective in the treatment for tendinopathy, they can be associated with pain during the beginning of treatment and must be continued for several weeks. One study indicated that a regimen of 12 weeks of eccentric training is needed for optimal recovery from Achilles tendinopathy.⁹ Although initially painful, repeated treatment with these exercises may provide some analgesic effects.²¹ Some patients find these exercises difficult because of the duration and frequency needed coupled with the pain.¹⁹ Although there are some limitations to these exercises, they have been proven to be the most effective exercises for the treatment of tendinopathy. Eccentric exercises can be even more effective when used in combination with static stretching.²¹ When prescribing an exercise plan, stretching should always be ordered in conjunction with that plan.

Avoid Injections and Anti-inflammatory Medications

There are several types of injections that have been used in the treatment of tendinopathy. The most well-known is corticosteroid injection. Other injections that have been used for tendinopathies include platelet-rich plasma (PRP), prolotherapy, and growth hormone. Injections should be used with caution for the treatment of tendinopathy.

Corticosteroids

Corticosteroids have been used widely and frequently to treat recalcitrant and severe cases of tendinopathy. Research supports that in the short-term corticosteroids can decrease pain and improve symptoms of tendinopathy.²³ Several long-term studies show that although short-term improvement in symptoms is possible from corticosteroids, long-term effects may be more harmful than beneficial.²³⁻²⁵ Although corticosteroids can decrease the amount of pain felt by the patient in the short-term, they have not been proven to be more effective in pain relief than NSAIDs.²³ Corticosteroid injections for tendinopathy can cause further degeneration and leave the tendon weaker and more prone to recurrent tendinopathy.²³ A systematic review of corticosteroid use for tendinopathy states that in the long run it may be better to do nothing for tendinopathy rather than using corticosteroid injections.²³ Considering the pathophysiology behind tendinopathy, it is no surprise that corticosteroids can be detrimental to the healing of tendinopathies. Corticosteroids can delay healing and decrease inflammation. Because a majority of tendinopathies are caused by tendinosis, using corticosteroid injections for the treatment of tendinopathies is not advised.

PRP

There has been much controversy over the use of PRP injections as a treatment for tendinopathy. Several studies comparing PRP with corticosteroids and long-term effects have shown that PRP is more beneficial for tendinopathy in the long-term than corticosteroids.^{19,26} However, when compared with a saline injection, PRP did not prove to be beneficial in the treatment of tendinopathy.²⁷ A systematic review of PRP as a treatment for tendinopathy concluded that PRP is no better than placebo for the treatment of tendinopathy.²⁶ There is still further research needed in this area. Based on current information, PRP is not recommended in the treatment of tendinopathy.

NSAIDs

It is now well established that NSAIDs can have a detrimental effect on bone healing after a fracture. Because of this, there has been speculation that NSAIDs may have similar effects on injured

tendons. The same convincing evidence is not available for NSAID use and tendon injuries. NSAIDs have been one of the most used medications for tendinopathy because of pain relief and anti-inflammatory properties. NSAIDs continue to be used frequently for tendinopathy. With an understanding of the physiology behind tendinopathy, NSAID treatment for tendinopathy has been called into question. It has been hypothesized that NSAIDs may contribute to further degeneration of the tendon as well.²⁵ The evidence to support this hypothesis is still minimal, but it is growing.^{5,25} Several animal studies and cultured tendon studies have shown that NSAIDs can potentially decrease tendon cell migration and delay tendon healing. These conclusions have yet to be proven in a human population. There is also some evidence to support that NSAID use can decrease the risk of tendon adhesions after injury, thus helping to maintain range of motion. There is still a lack of evidence regarding NSAID use and tendon injury. Because of this lack of evidence, no conclusion can be made regarding the safety and efficacy of NSAID use with tendinopathy.

Give It Time

Because of the degenerative nature of most tendinopathies, it takes several weeks to months for healing to occur. Even with proper treatment, there may be some residual weakness and thickening of the tendon, but full functionality can usually be restored.⁵ Many patients become frustrated by the length of treatment needed for the improvement of their symptoms. As a result, many patients return to full activity too early and fail to achieve optimal healing. Many of these frustrations can be avoided by giving the patient a realistic picture of the needed duration for optimal treatment.

CONCLUSION

Tendinopathy continues to be a frequently diagnosed injury in the health care setting. It continues to be a difficult condition to treat and can be very frustrating to the patient because of recurrence and the many months needed for healing. Proper treatment and patient education can minimize some of this frustration and improve outcomes.

Tendinopathies continue to be widely misunderstood by the health care community. Some of this confusion stems from the current nomenclature regarding tendinopathies. It is now well documented that the majority of tendinopathies are caused by a failed healing process that leads to degeneration and weakening of the tendon. Very few cases can be attributed to an inflammatory process. Understanding the physiology behind tendinopathy will help guide the health care provider in the proper implementation of effective management interventions. There are several principles that should be followed by the health care provider when treating tendinopathy. These principles include resting the tendon; icing the affected area; using eccentric exercises and stretches; avoiding injections, especially corticosteroid injections; and giving the tendon proper time to heal. Conservative treatment continues to be an effective philosophy for treatment. With a firm understanding of these principles, the health care provider will be more able to effectively diagnose and treat tendinopathy. **JNP**

References

1. Khan KM, Cook JL, Kannus P, Maffulli N, Bonar SF. Time to abandon the "tendinitis" myth. *BMJ*. 2002;324(7338):626-627.
2. Longo UG, Ronga M, Maffulli N. Achilles tendinopathy. *Sports Med Arthrosc*. 2009;17(2):112-126.
3. Scott A, Lian Ø, Roberts CR, et al. Increased versican content is associated with tendinosis pathology in the patellar tendon of athletes with jumper's knee. *Scand J Med Sci Sports*. 2008;18(4):427-435.
4. Khan KM, Cook JL, Bonar F, Harcourt P, Astrom M. Histopathology of common tendinopathies. Update and implications for clinical management. *Sports Med*. 1999;27(6):393-408.
5. Rees JD, Maffulli N, Cook J. Management of tendinopathy. *Am J Sports Med*. 2009;37(9):1855-1867.
6. Goldin M, Malanga GA. Tendinopathy: a review of the pathophysiology and evidence for treatment. *Phys Sportsmed*. 2013;41(3):36-49.
7. Tan SC, Chan O. Achilles and patellar tendinopathy: current understanding of pathophysiology and management. *Disabil Rehabil*. 2008;30(20-22):1608-1615.
8. Gaida JE, Cook JL, Bass SL. Adiposity and tendinopathy. *Disabil Rehabil*. 2008;30(20-22):1555-1562.
9. Cook JL, Khan KM, Purdam C. Achilles tendinopathy. *Man Ther*. 2002;7(3):121-130.
10. Cook JL, Khan KM, Maffulli N, Purdam C. Overuse tendinosis, not tendinitis part 2: applying the new approach to patellar tendinopathy. *Phys Sportsmed*. 2000;28(6):31-46.
11. Chessin M. Achilles tendinosis stopping the progression to disability. *J Dance Med Sci*. 2012;16(3):109-115.
12. Järvinen TAH, Kannus P, Maffulli N, Khan KM. Achilles tendon disorders: etiology and epidemiology. *Foot Ankle Clin*. 2005;10(2):255-266.
13. Cook JL, Khan KM, Kiss ZS, Purdam CR, Griffiths L. Reproducibility and clinical utility of tendon palpation to detect patellar tendinopathy in young basketball players. Victorian Institute of Sport tendon study group. *Br J Sports Med*. 2001;35(1):65-69.
14. Ottenheim RP, Jansen MJ, Staal JB, et al. Accuracy of diagnostic ultrasound in patients with suspected subacromial disorders: a systematic review and meta-analysis. *Arch Phys Med Rehabil*. 2010;91(10):1616-1625.
15. Yang X, Pugh ND, Coleman DP, Nokes LDM. Are Doppler studies a useful method of assessing neovascularization in human Achilles tendinopathy? A systematic review and suggestions for optimizing machine settings. *J Med Eng Technol*. 2010;34(7-8):365-372.
16. McLauchlan GJ, Handoll HH. Interventions for treating acute and chronic Achilles tendinitis. *Cochrane Database Syst Rev*. 2001;(2):CD000232. <http://dx.doi.org/10.1002/14651858.CD000232>.
17. Roche AJ, Calder JDF. Achilles tendinopathy: A review of the current concepts of treatment. *Bone Joint J*. 2013;95-B(10):1299-1307.
18. Mayor RB. Treatment of athletic tendonopathy. *Conn Med*. 2012;76(8):471-475.
19. Rees JD, Wolman RL, Wilson A. Eccentric exercises; why do they work, what are the problems and how can we improve them? *Br J Sports Med*. 2009;43(4):242-246.
20. Knobloch K, Schreibmueller L, Longo UG, Vogt PM. Eccentric exercises for the management of tendinopathy of the main body of the Achilles tendon with or without an AIRHEEL brace. A randomized controlled trial. B: effects of compliance. *Disabil Rehabil*. 2008;30(20-22):1692-1696.
21. Dimitrios S, Pantelis M, Kalliopi S. Comparing the effects of eccentric training with eccentric training and static stretching exercises in the treatment of patellar tendinopathy. A controlled clinical trial. *Clin Rehabil*. 2012;26(5):423-430.
22. Wiergerinck JI, Kerkhoffs GM, van Sterkenburg MN, Siersevelt IN, van Dijk CN. Treatment for insertional Achilles tendinopathy: a systematic review. *Knee Surg Sports Traumatol Arthrosc*. 2013;21(6):1345-1355.
23. Coombes BK, Bisset L, Vicenzino B. Efficacy and safety of corticosteroid injections and other injections for management of tendinopathy: a systematic review of randomised controlled trials. *Lancet*. 2010;376(9754):1751-1767.
24. Gaujoux-Viala C, Dougados M, Gossec L. Efficacy and safety of steroid injections for shoulder and elbow tendonitis: a meta-analysis of randomised controlled trials. *Ann Rheum Dis*. 2009;68(12):1843-1849.
25. Scott A, Khan KM. Corticosteroids: short-term gain for long-term pain? *Lancet*. 2010;376(9754):1714-1715.
26. de Vos R-J, Windt J, Weir A. Strong evidence against platelet-rich plasma injections for chronic lateral epicondylar tendinopathy: a systematic review. *Br J Sports Med*. 2014;48(12):952-956.
27. de Vos RJ, Weir A, van Schie HT, et al. Platelet-rich plasma injection for chronic Achilles tendinopathy: a randomized controlled trial. *JAMA*. 2010;303(2):144-149.

Craig Nuttall, MSN, FNP-C, and Ryan Rasmussen, MS, FNP-C, are assistant teaching professors at Brigham Young University College of Nursing in Provo, UT. Craig Nuttall can be reached at c.nuttall16@gmail.com. In compliance with national ethical guidelines, the authors report no relationships with business or industry that would pose a conflict of interest.

1555-4155/14/\$ see front matter
© 2014 Elsevier, Inc. All rights reserved.
<http://dx.doi.org/10.1016/j.nurpra.2014.07.016>