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# Treating Chronic Tendinopathy: Physical Therapy, Surgery and Other Form of Therapy

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**Abstract:**

Introduction: The term "tendinopathy" refers to pathological changes in tendons. The previously used term "tendonitis" does not fully capture the nature of the condition, as inflammatory changes, when present, are secondary to degenerative damage. Tendinopathies are quite common in the general population.

Aim: The aim of this review is to characterize various types of tendinopathies, with a focus on both conservative and surgical treatment methods, in order to organize available information that may be helpful for clinicians in their practice.

State of Knowledge: Chronic tendinopathies develop as a result of multiple factors. The most significant include improper exercise techniques, excessive strain, and musculoskeletal system abnormalities.

Summary (Conclusions): The approach to tendinopathy treatment should vary depending on the patient's clinical condition and provoking factors. Physiotherapy plays the most important role, along with supportive methods such as analgesic pharmacotherapy and cryotherapy. Surgical intervention may be necessary in cases where conservative treatment fails.

**Key words:** Tendinopathy, Therapy, Review, Surgical repair, Conservative Treatment, Achilles Tendon

## Introduction:

Tendon injuries represent a large spectrum of conditions. When discussing these, it is important to mentions terms such as “tendinitis”, “tendinosis”, and “tendinopathy”. The most appropriate term is “tendinopathy”(Scott et al., 2013). Clinical symptoms and the etiology of the condition indicate that a degenerative process is more significant than inflammation in this disease, and the term "tendinitis" should be regarded as more of a historical reference(Rees et al., 2014). Tendon injuries are a common condition in the population, frequently affecting individuals engaged in sports activities.

**Pathophysiology, Epidemiology, and Characteristics:**

The pathophysiology of the condition is not completely clear. Historically, the inflammatory process was considered etiologically significant, hence the term "tendinitis." More recent studies indicate the presence of inflammatory cells (monocytes, macrophages, or lymphocytes); however, this is most likely a secondary response to other types of damage.(Mosca et al., 2018) Tendons are composed of longitudinally aligned collagen fibers, predominantly type 1 collagen. In the histological structure two main cell types can be identified: tenoblasts (immature cells with high metabolic activity) and tenocytes (mature cells).(Sakabe & Sakai, 2011) Pathological changes usually occur in areas with poor blood supply. When the applied load does not exceed physiological limits (tendon stretch up to 4% of its length), the process is anabolic. However, when this threshold is exceeded, a catabolic response occurs. The most significant aspect of the disease process is tendon disturbances in the regeneration process after damage.(Sharma & Maffulli, 2005) Acute injuries are typically tendon ruptures, which are influenced by internal/non-modifiable factors such as height, age, and genetic predisposition. Chronic injuries, referred to as tendinopathies, result from prolonged overloading of the tendons.

Tendinopathy is a common condition. For example, the lifetime prevalence of Achilles tendon tendinopathy among runners is approximately 52%(Scott et al., 2011). Data suggests that tendinopathy may account for 30% of running-related injuries.(Sharma & Maffulli, 2005) Rotator cuff tendinopathy may be responsible for 19 cases per 1,000 instances of upper limb pain(Dejaco et al., 2017)

The risk factors for the development of tendinopathy can be divided into:(Malliaras et al., 2013), (Magnan et al., 2014)

- external (modifiable)- obesity, excessive and non-physiological physical activity, improper footwear selection, hormonal and metabolic disorders (hyperlipidaemia, hyperuricaemia), too rapid return to sporting activity, training

errors. Certain medications, such as fluoroquinolones, aromatase inhibitors or glucocorticosteroids can also contribute to the development of tendinopathy.

- Intrinsic (non-modifiable)- male sex, age (increased risk after 35 years of age), postural abnormalities, flat foot, pes cavus, genetic factors.

**The most common tendinopathies:**

- Rotator cuff tendinopathy- this pathology affects the structure composed of the following muscles: subscapularis, teres minor, infraspinatus, and supraspinatus. It is within the supraspinatus muscle that pathology occurs most frequently. Patients typically report pain, weakness, and stiffness. Chronic injury can lead to disability or tendon rupture. Rehabilitation is crucial in treatment, and corticosteroid injections are used for rapid but short-term pain relief. After 6 months of rehabilitation and other methods have failed, surgery remains to be considered. (Leong et al., 2019; Littlewood et al., 2012; Rosa, 2001)

- Achilles tendon tendinopathy- is a pathology that affects runners particularly frequently, with up to 52% of former runners reported to have it. Patients usually report pain in the middle parts of the tendon. Chronic tendiopathy is present when the pain lasts for more than three-six months. The diagnosis is based on clinical symptoms and additional imaging tests are not required. The mainstay of treatment for this tendinopathy is rehabilitation with resistance exercises. However, it should be noted that research on this topic has numerous methodological limitations. In addition, heel lifts or shoe wear and inserts can be used for treatment. Adjunct interventions include: massage therapy, extracorporeal shockwave therapy or injections of glucocorticoids. Surgical intervention may be needed for chronic painful tendinopathy. (Alfredson & Lorentzon, 2000; Maffulli et al., 2008; Scott et al., 2011)

- Elbow tendinopathy- depending on the location, we distinguish between lateral elbow tendinopathy (LET), known as "tennis elbow," where pain occurs in the lateral aspect of the elbow, and medial elbow tendinopathy (MET), or "golfer's elbow," where pain is localized in the medial elbow region. LET affects

approximately 1.3% of the population, while MET affects about 0.4%. Risk factors include obesity, age between 45 and 54, smoking, and strenuous physical activity. Patients report pain and tenderness in the affected elbow area. Diagnosis is based on clinical criteria, in some cases ultrasound may be helpful. The first line of treatment involves physiotherapy, typically focusing on eccentric exercises, which have been shown in studies to be more effective than steroid injections or no treatment. Other treatment options include cold compresses and the use of braces. Surgical treatment is considered when these methods fail to produce the desired results. According to a retrospective study, no significant differences were found in outcomes between arthroscopy, percutaneous techniques, and open surgery.(Couppé et al., 2022; Shiri et al., 2006)

**Diagnostic Imaging:**

Medical history is crucial in the diagnosis of the disease. Ultrasound (USG) and magnetic resonance imaging (MRI) can be helpful in detecting lesions, but it is important to remember that no single imaging study can confirm or exclude tendinopathy. Doppler ultrasound can be useful in diagnosis, and there is a moderate correlation between increased Doppler signal and the presence of disease symptoms in the patient. MRI is more effective than ultrasound in discriminating lesions. In MRI projections, altered tissues show increased signal intensity, which is indicative of pathological changes.(Cook et al., 2004; Kayser et al., 2005)

**Treatment Approaches:**

The approach to treatment varies. The most important thing is to prevent the occurrence of overexertion and to take care of the physiological conditions of training. When tendinopathy occurs, the basic methods are: reduction of effort, but not total elimination, modification of activity. In subsequent stages, it is important to include rehabilitation methods such as resistance exercise (eccentric, concentric or isometric), shock wave therapy, cryotherapy.

Medications may also be used: nonsteroidal anti-inflammatory drugs (NSAIDs), glucocorticoids

**Conservative treatment:**

Kinesiotherapy in the treatment of tendinopathy primarily focuses on eccentric exercises, which involve applying pressure to the tendon and muscle during elongation, and concentric exercises, which load the tendon and muscle during contraction. There are no definitive guidelines or recommendations regarding which type of exercise is more effective.(Childress & Beutler, 2013; Rees et al., 2009)

The effectiveness of shock wave therapy (SWT) remains inconclusive. Some studies suggest that SWT has comparable efficacy to physiotherapy, glucocorticoid injections, surgical interventions, or platelet-rich plasma (PRP) injections. One review showed moderate effectiveness of SWT for Achilles tendon and patellar tendinopathy. However, other reports highlight a lack of sufficient evidence supporting SWT's efficacy in cases of lateral elbow tendinopathy (LET) and rotator cuff tendinopathy. One systematic review indicated insufficient evidence to recommend SWT for Achilles tendon tendinopathy. (Kvalvaag et al., 2017; Scott et al., 2011)

Cryotherapy and heat therapy are commonly used methods in the treatment of tendinopathy. Unfortunately, there is a lack of conclusive research on this topic. In one study where cryotherapy was added to physiotherapy for elbow tendinopathy, no significant benefits were observed. However, in another study where patients received heat therapy, increased treatment satisfaction was noted. Despite the limited data, cryotherapy, being a simple and cost-effective method, is applied in various types of tendinopathies. Cold therapy likely contributes to its anti-inflammatory effects and reduces the formation of new blood vessels, thereby alleviating pain.(Bleakley et al., 2004; Manias & Stasinopoulos, 2006)

Pharmacological treatment for tendinopathy may include glucocorticoid injections. The effectiveness of this method varies depending on the duration of

the condition. Studies suggest that glucocorticoid injections are effective in the short term, primarily in relieving pain. However, in the medium and long term, the effectiveness is questionable, likely because the core pathology of the disease is not inflammation.(Dean et al., 2014)

Non-steroidal anti-inflammatory drugs (NSAIDs) can be useful for short-term pain management. However, long-term use of NSAIDs should be avoided due to their side effects, such as decreased tenocyte activity. (Tsai et al., 2007)

Nitroglycerin applied topically, in the form of a patch, is one of the newer treatments. The nitric oxide released from the patch penetrates the tendon and promotes collagen synthesis. This method also helps to reduce the pain experienced by patients and improve tendon function. Meta-analyses on the use of nitroglycerin in tendinopathy suggest improvements in medium-term outcomes, including increased strength, patient satisfaction, and pain reduction.(Kane et al., 2008; Pons et al., 2001)

There are also several experimental methods. There are studies on treatment with insulin-like growth factor (IGF), transforming growth factor (TGF), platelet-derived growth factor (PDGF). However, these methods are still under research.

Another option is sclerotherapy, which aims to reduce neovascularization by administering polidocanol, and local injection of stem cells, which are intended to support tendon regeneration.(Alfredson & Ohberg, 2005a, 2005b)

**Surgical treatment:**

Surgical treatment is considered if there is no significant clinical improvement after at least 6 months of rehabilitation. According to the data 10-45% of patients do not report improvement after non-surgical treatment.(Aicale et al., 2018) A thorough evaluation of the benefits and contraindications for surgery is necessary. Systematic reviews indicate that surgical interventions have better effects, compared to placebo or no treatment, though the differences between the

effects of rehabilitation and surgery are relatively small.(Challoumas et al., 2019) The success rates of surgical procedures remain inconsistent.

Surgical techniques include open procedures and less invasive options, such as percutaneous ultrasonic tenotomy or arthroscopy. The choice of technique and method should depend on the location of the injury and the patient's clinical condition. Open procedures are typically associated with a longer recovery period (6 to 12 weeks). The open technique involves making an incision in the tendon, followed by the removal of adhesions and debridement of the damaged tissue.(Verstraelen et al., 2017) Minimally invasive techniques, which do not disrupt the tendon, allow for shorter recovery times.(Baltes et al., 2017)

There are variations in surgical techniques depending on the location of the injury. In the case of Achilles tendon tendinopathy, the anterior part of the tendon is treated by debridement or removal of the area with neovascularisation. In contrast for patellar tendinopathy, the posterior part of the tendon undergoes debridement to remove neovascularization.(Ruergård & Alfredson, 2014) One example of a minimally invasive technique is percutaneous ultrasonic tenotomy, which uses ultrasound to debride the tissue.(Barnes et al., 2015) Arthroscopy is considered the best option for patients seeking a quick return to activity, such as athletes.(Baltes et al., 2017)

**Systematic Review Objective:**

The aim of this review was to collect, systematise, and summarize the available knowledge on tendinopathy and its treatment methods. In conducting this review, systematic reviews, meta-analyses, and clinical studies were utilized.

**Conclusions:**

Tendinopathies represent a broad group of conditions affecting individuals of varying ages and clinical statuses. The diverse etiology of tendinopathy means that there is no single universally effective treatment method. The scarcity of data and often low methodological quality of available studies make it difficult to establish clear treatment standards. Rehabilitation plays a crucial role in

treatment, while pharmacotherapy can serve as a supportive measure. Surgical methods should be considered only when conservative treatment over at least 6 months has not yielded satisfactory results. Several new treatment methods, such as the use of stem cells, are currently under investigation.

This review presents a comprehensive overview of the available information on the etiology, epidemiology, and treatment of various forms of tendinopathy.

## Disclosure

### Author's contribution

Conceptualization: A. Łukawski; methodology: K. Wojtach, W.Górska; software: I. Wiak, W.Górska; check: F. Czyżewski, F. Banyś; formal analysis: A.Łukawski, A.Dziegciarczyk, J.Szałajska; investigation: F.Czyżewski, A.Łukawski, K.Bochen; resources: F. Jasiński, K.Wojtach, F.Banyś; data curation: K.Bochen, F.Czyżewski; writing-rough preparation: A.Łukawski, A.Dziegciarczyk, J.Szałajska; writing – review and editing: A.Łukawski, I.Wiak, F.Jasiński; visualization: F.Banyś, A.Łukawski, K. Wojtach; supervision: A. Łukawski, J.Szałajska; project administration: A. Łukawski

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### Conflict of interest

The authors deny any conflict of interest.

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