



Review

Preventive interventions for tendinopathy: A systematic review



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ABSTRACT

Objectives: Tendinopathy, the most prevalent tendon disorder which is considered as the clinical diagnosis of pain and dysfunction, is common in sports and its prevalence is ever-increasing. Despite the lack of clarity about risk factors, various preventive interventions for tendinopathy have been investigated. The main objective of this study is to review current preventive interventions for tendinopathy in the major regions: ankle, knee, hip, groin, shoulder and elbow.

Design: A systematic literature search was conducted.

Methods: The PubMed and Embase databases were explored to identify articles that met the inclusion criteria. The included studies were assessed on methodological quality and data was summarized.

Results: Ten articles were included that describe a wide variety of preventive interventions. These were divided into three categories: stretch and exercise interventions, shoe adaptations and other interventions. The methodological quality of the studies was moderate to high. Three out of ten studies showed a significant beneficial result.

Conclusions: There is limited evidence that a long-term intervention including balance training is effective in the prevention of patellar and Achilles tendinopathy. Shoe adaptations in the form of shock absorbing insoles could have a preventive effect on Achilles tendinopathy. Hormone replacement therapy seems to reduce the risk for structural Achilles tendon changes in active post-menopausal women. No evidence was found for a positive effect of stretching exercises. Prophylactic eccentric training and stretching can increase the risk of injury in asymptomatic players with patellar tendon abnormalities. A limited amount of studies was available and more research is needed on (multifactorial) etiology, risk factors and preventive interventions.

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1. Introduction

Tendinopathy, the most prevalent tendon disorder which is considered as the clinical diagnosis of pain and dysfunction of a tendon, is common in sports and its prevalence is ever-increasing.^{1–4} It is frequent among athletes but can also affect non-athletes.⁵ It affects more men than women and the general incidence of tendon injuries changes with age.^{3,6–9} Tendinopathy is characterized clinically by pain and dysfunction and histopathologically by tendon disrepair and degeneration.^{10–12} The prognosis is often poor,

with a high incidence of chronicity and recurrence.^{13–15} Risk factors include the presence of a tendon abnormality as shown on ultrasound and a change in tendon load.^{10,16} No established treatment method exists, thereby treatment usually consists of relative rest and load management. This makes the rehabilitation of tendinopathy a time-consuming process. The presumable consequences of this type of overuse injury constitute a major influence on an athlete's sports career, physical and psychosocial well-being, and quality of life.^{17,18} These characteristics of tendinopathy stress the importance of prevention.^{19,20}

van Mechelen et al. designed a model for the development of preventive interventions for sports injuries.²¹ The first step in this model is to identify the extent of the injury problem, by describing injury incidence and indicators of severity. Second, etiologic factors and mechanisms that play a role in the emergence of the injury have to be described. The following step includes the

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development of measures that reduce the risk and/or severity of the sports injury, based on the etiological factors described in step 2. The fourth and final step comprises the evaluation of the effect of these measures by repeating step 1. According to this model, it is clear that knowledge of risk factors, including both extrinsic modifiable and intrinsic modifiable risk factors, is essential for the development of preventive measures.^{11,21,22} It is known that tendinopathy has a multifactorial etiology, but studies examining risk factors of tendinopathy show a lack of uniformity and statistical power and are mostly not prospective.^{11,22}

Despite the lack of clarity about risk factors, various preventive interventions for tendinopathy have already been described. The main objective of this study is to review current preventive interventions for tendinopathy in the major regions: ankle, knee, hip, groin, shoulder and elbow.

2. Methods

The focus of the review lay on tendinopathy in the major regions: ankle, knee, hip, groin, shoulder and elbow. The PubMed and Embase databases were explored in February 2015 to identify articles that met the inclusion criteria, using the search terms as shown in Table 1.

Articles were included if they met the following criteria: they studied a preventive intervention for tendinopathy in a specific tendon of the ankle, knee, hip, groin, shoulder or elbow, were written in English, the outcome measures were either incidence/prevalence of tendinopathy which is considered as the clinical diagnosis of pain and dysfunction of a tendon, or presence of tendon abnormalities (as tendon abnormalities are considered to be a predisposer of tendinopathy) and the testing population consisted of humans. RCTs, cohort studies, single-case designs, before- and after-designs, case-control studies, cross-sectional studies and case studies were included. To make the analysis as general and comprehensive as possible, there were no limitations of age, sex or activity level. Any type of intervention or intervention program, be it exercise or medicated, was included. Articles were excluded (1) which were reviews or letters, (2) when rehabilitation interventions were examined and (3) when no incidences of specific tendinopathies were reported. Articles involving the prevention of re-injury were also excluded. After screening titles and abstracts, full texts were obtained for items for which inclusion or exclusion could not be determined. Finally, the reference lists of included articles were screened for additional articles. Reviews that resulted from the search were scanned for references, with the same inclusion and exclusion criteria.

Data regarding type of tendinopathy, study design, participants, intervention protocol and results were extracted from the included studies and summarized.

The included studies were assessed by two authors independently using a quality assessment tool developed by the McMaster University Occupational Therapy Evidence-Based Practice Research Group.²³ The quality assessment consisted of nine categories: citation, study purpose, literature, design, sample, outcomes, intervention, results, and conclusions and implications. This method is appropriate to assess RCTs, cohort studies, single-case designs, before- and after-designs, case control studies, cross-sectional studies and case studies. The guidelines established by Law et al. were utilized for the quality assessment.²⁴ Every item was answered with 'yes', 'no', 'not addressed' or 'not applicable (N/A)'. The sum of these outcomes predicted the overall quality of the study assessed (ranging from 0 to 14). In addition, every item was provided with supplementary information to substantiate the choices made. Discrepancies between the two assessors were resolved by discussion and the final decision was made by a third person.

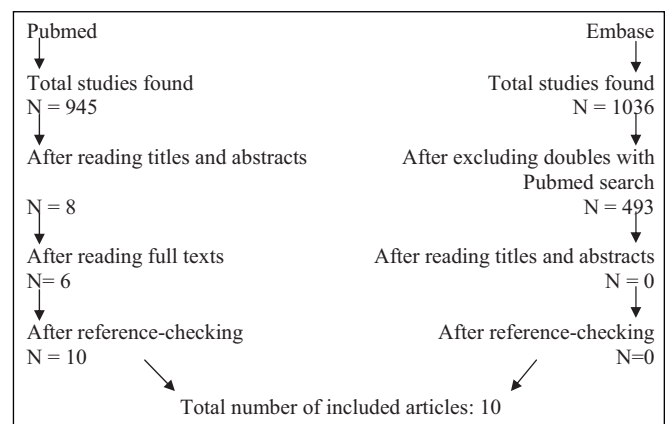


Fig. 1. Study inclusion flowchart.

3. Results

The search in PubMed resulted in 945 articles and the search in Embase in 1036 articles. After removing duplicates and screening on title, abstract and full text, six articles remained in the analysis. The screening of reference lists led to four extra articles, which ultimately resulted in a total number of 10 included articles. Fig. 1 demonstrates a flowchart of the inclusion.

Nine studies investigated the effects of a preventive intervention on the incidence of tendinopathy and one study investigated the effects of a preventive intervention on the presence of tendon abnormalities as a predisposer of tendinopathy. Preventive interventions for the Achilles tendon were studied nine times, prevention of patellar tendinopathy two times, and prevention of groin tendinopathy once. The studies included consisted of six RCTs, three cohort studies and one case control study. The scores of the methodological quality assessment are shown in Table 2. Total scores in percentages ranged between 50% and 79%. The average score was 70%.

Three studies reported significant improvements of their intervention (or a part of it) on incidence of specific tendon injuries. The first study examined the effect on incidence of Achilles and patellar tendinopathy,²⁵ the second and third on Achilles tendinopathy.^{26,27} The various interventions were divided into three categories: stretch and exercise interventions (five articles), shoe adaptations (three articles) and other interventions (two articles). An overview of all included articles is shown in Table 3 and described below.

In the first category, stretch and exercise interventions, Kraemer and Knobloch²⁵ found that a program that included soccer-specific balance training can significantly reduce the incidence of patellar and Achilles tendinopathy. A dose-effect relationship between duration of balance training and injury incidence was evident.²⁵ The other studies within this category did not find a positive effect on incidence of tendinopathy. Holmich et al. conducted a study to determine the effects of an exercise program, including strengthening, coordination and core stability during warm up, on the incidence of groin injuries.²⁸ No significant effect of the intervention on the rate of groin injuries was found. Pope and colleagues found no evidence for the preventive effects of pre-exercise stretching on the incidence of lower extremity injury, including Achilles tendinopathy.²⁹ In addition, Fredberg and colleagues¹⁴ found that their prophylactic eccentric training and stretching program reduced the risk of developing patellar tendon abnormalities, but had no positive effects on injury risk. On the contrary, in asymptomatic players with patellar tendon abnormalities, prophylactic eccentric training and stretching increased the risk of injury.¹⁴ In addition to the research on the preventive effects of stretching in general, Amako and colleagues³⁰ studied more specifically the

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