



## Summary

The Achilles tendon (AT) is the strongest and thickest human tendon. Nevertheless AT is the most susceptible tendon to injury. The relationship between sports and AT pathologies is well established. Functioning AT is essential to participate in sports and sports activities are needed as well to maintain the integrity of AT. However, inappropriate participation in sports may jeopardize the AT. AT can be affected by a variety of disorders ranging from mild inflammation to irreparable damage. Degenerative, infectious and chemical, mechanical hypotheses were postulated concerning development of AT tendinopathy, although clear etiology of AT tendinopathy is not yet identified. The mainstay of treatment of AT tendinopathy is a non-operative. Boot- or walker stabilization with partial reduction of plantar flexion and physiotherapy of acute closed AT injuries are performed in small gap or partial ruptures. Operative treatment is indicated in open deep AT lacerations, large gap AT ruptures, or chronic ruptures. Restoration of AT continuity and function are the aim of the surgical reconstruction in order to bring the patients and athletes to their normal physical level.

### Keywords

Achilles tendon – Sport – tendinitis – tendinopathy – tendon rupture

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## Die Achillessehne im Sport

### Zusammenfassung

Die Achillessehne ist die stärkste und dickste Sehne des menschlichen Körpers. Nichtsdestotrotz ist deren Verletzung häufig, v.a. im Sport. Die Achillessehne ist wichtig für die Sportfähigkeit und der Sport ist wichtig für die Integrität der Achillessehne. Ungeeignete Sportaktivitäten können die Achillessehne betreffen. Viele Entitäten können die Achillessehne durch Entzündung bis hin zu irreparablem Schaden

## REVIEW / SPECIAL ISSUE

# Achilles tendon in Sport

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## Introduction

Achilles tendon (AT) is known to be the strongest and thickest human tendon, but it is still the most liable tendon to injury [25]. Disorders related to AT in athletes are very common. Tendinopathy of TA was commonly reported in runners, and individuals involved in sports such as racquet, track and field, volleyball and soccer. Moreover, insertional tendinitis was referred to be an overuse injury [50,83,17]. Cassel et al reported a prevalence of 1.8% AT tendinopathy among adolescent athletes, which was found to be less frequent than patellar tendinopathy among the same age group [13]. The overall incidence of AT injuries ranges from 10 to 20 per 100000 [8,77]. Raikin et al reported that 24% of AT injuries surveyed in their study were chronic [74]. Some

patients may not seek medical advice earlier following AT injury as they feel gradual improvement in pain intensity. Moreover, nearly a quarter of AT injuries may go unnoticed or misdiagnosed by healthcare practitioners during initial evaluation [74,10,70,36,48].

TA calcaneal attachment shows characteristic configuration with medial and lateral extensions distributing the forces evenly at the tendon bone junction. Posterior tibial artery represents the main blood supply to the upper and lower portions of TA while the middle part blood supply is predominantly derived from the peroneal artery. So, the relative inadequate blood supply to the middle zone of TA could explain its predisposition to injury. Normal TA is rich in collagen type I with superior biomechanical properties as compared to collagen type III which is found abundantly in the areas of tendon healing [25].

## Etiology and risk factors

It is believed recently that TA tendinopathy or rupture is due to multiple factors but no consensus on the underlying cause of such pathologies. Some studies attributed spontaneous ruptures to

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tangieren. Degeneration, Infektion, chemische Agentien und mechanische Zustände können die Entwicklung von Tendinopathie auslösen, obwohl deren Aetiologie noch nicht ganz verstanden ist. Die Achilles-Tendinopathie wird vorzugsweise konservativ behandelt. Schuh- oder Walker-Stabilität mit gradueller Reduktion der Plantarflexion und Physiotherapie sind indiziert bei Achillessehnenrupturen mit geringer Dehiszenz oder Partialrupturen. Chirurgische Behandlung ist indiziert bei offenen Verletzungen, Achillessehnenrupturen mit großer Dehiszenz und chronischen Rupturen. Die Wiederherstellung der Kontinuität und Funktion ist das Ziel, um die Patienten und Athleten zu ihrer normalen Leistungsfähigkeit zu bringen.

#### Schlüsselwörter

Achillessehne – Sport – Tendinitis – Tendinopathie – Sehnenruptur

**Table 1.** Risk factors of Achilles tendinopathy.

#### Intrinsic factors:

- Aging (not fully proven)
- Male gender (not fully proven)
- High body mass index (BMI)
- Tendon temperature
- Systemic diseases
- Muscle physiological and anatomical properties
- Genetic predisposition
- Blood supply
- Malalignment: hindfoot hyperpronation, hindfoot varus
- Leg length discrepancy
- Stiff subtalar joint
- Hindfoot hypermobility
- Gastrocnemius-Soleus contracture

#### Extrinsic factors:

- Use of drugs: e.g. fluoroquinolones, steroids
- Overuse: frequent micro-injury
- Sport training errors
- Sports shoes with Achilles tendon impingement

inflammatory, degenerative, infectious, pharmacological and neurological causes [99,56,21,47,87,89]. Risk factors for AT tendinopathy are summarized in Table 1 [56].

The use of drugs such as fluoroquinolones and corticosteroids may increase the risk of tendinopathy and rupture especially [89]. Moreover, experiments on animals showed that local steroid injections might have a transient negative effect on the strength of the tendon with intra-substance administration and a neutral effect if applied in the paratenon [47,87]. Such a weakness may last up to 2 weeks; so, it is recommended to avoid high-impact activities during this period [41]. Also, unilateral and bilateral ruptures were reported in patients on oral steroid therapy [21,44].

Animal experiments suggested that AT degeneration may occur due to hyperthermia of the tendon, particularly during physical exercises, which may predispose to tendinopathy and rupture later on [99,56].

Middle-aged men with intermittent participation in sports are at risk of spontaneous AT tears [64,75]. Male gender appears not to be a risk factor despite of high percentage of male subjects shown in many studies. Moreover, aging has not yet been fully proven as risk factor. The incidence of AT disorders was found commonly in middle-age people [56,86].

Scott et al found that 76% of Achilles tendon injuries treated in their institute were related to sports [86]. Further, AT injuries showed a significant increase during sport seasons [86]. Hindfoot hypermobility and Gastroc-Soleus insufficiency were found to be contributing to development of tendinopathy in runners depending on a biomechanical study by McCrory [60]. Also hindfoot malalignment, as e.g. hyperpronation, is known to be involved in the Achilles tendinopathy development.

Tendinopathy could be a component of Haglund's syndrome due to mechanical irritation of the tendon and its bursa, which may be associated with soft tissue thickening at the

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