CHRONIC PAIN IN THE ACHILLES TENDON

– Written by Håkan Alfredson, Johannes Tol and Robert-Jan de Vos

PREFACE

According to Greek mythology, the legendary warrior Achilles was invulnerable except for his heel. It is written in the Iliad that he died due to an arrow that pierced his Achilles tendon, thus the "Achilles' heel" came to symbolise a person's principal weakness. Nowadays, weakness of the Achilles tendon is increasingly gaining attention to medical specialists.

INTRODUCTION

Achilles tendon disorders are a common entity in middle-aged active people. With increasing sports participation in the general population, the number of overuse injuries has increased[1]. Tendon disorders comprise 30 to 50% of all sports-related injuries and there is a lifetime risk of 52% in elite long-distance runners of suffering from an Achilles tendon injury[2]. Despite this high prevalence there is still a lack of knowledge about the aetiology and pathogenesis of these injuries.

The terminology used to describe chronic tendon disorders has changed in the past few decades. For many years this condition was persistently defined as "tendinitis", denoting an inflammation of the tendon[3]. Several researchers proposed abandoning this term as there were no signs of inflammation in chronic painful tendons analysed after biopsy or with microdialysis techniques. To redress this confusing terminology, the term "tendinopathy" was introduced to describe the clinical condition of pain, swelling and impaired performance. Nowadays this is the most accepted term for chronic Achilles tendon disorders. Histopathological studies showed that tendinopathy is frequently characterised by degeneration of the tendon tissue, also referred to as "tendinosis"[3]. The term tendinosis is based on histopathological characteristics and should only be used after histopathological confirmation[4]. The treatment of tendinopathy has been challenging in sports medicine and orthopaedics and it is therefore becoming a major problem in this field.

HISTOPATHOLOGY

Based on histopathological examination, changes of the Achilles tendon can be divided into intratendinous and paratendinous disorders, which can coexist[1].

Although tendinosis is a general term for intratendinous degeneration, on histological assessment tendinosis encompasses a wide range of histological degenerative entities not only affecting tendon fibres, but also tenocytes and other non-collagenous matrix components[4]. Macroscopically, degenerative tendon has a soft appearance with a greyish white colour. There are a few histopathological signs that are described in the literature. Most remarkable is the loss of a well-organised tendon tissue structure. The tendon bundles may show an increased crimping, and separation of bundles is often seen. Some advocate using the term "partial tear" when there is a large

area of seemingly discontinuous bundles, but this is debatable[1,4]. Another obvious feature is an increased vascularisation. The blood vessels are thought to be newly formed and are characterised by a tortuous phenotype and a small lumen. The functional relevance of these blood vessels is questionable as it is thought to be a failed healing response[5]. The blood vessels seem to arrive from the fat tissue ventral to the tendon, and recent studies have shown multiple sensory and sympathetic nerves located in close relation to the vessels in the paratendinous tissue outside the ventral tendon[6]. There are very few nerves inside the tendon.

An apparent macroscopical peritendinous change is thickening of the paratenon. In addition, adhesions may be present. These adhesions can result in contractions around the tendon due to proliferation of connective tissue. This can lead to tendon constriction and increased friction with the surrounding structures[1]. Diagnosis of this paratendinous disorder may be challenging.

CLINICAL FEATURES

Tendinopathy is a clinical diagnosis characterised by pain, swelling and impaired load bearing capacity[4]. On history, pain is typically felt in the tendon midportion. A common training error that is associated with tendinopathy is a rapid increase in activity. The phrase "too much, too soon" is frequently heard in the patient's history. Initially, pain is only present during the warming-up period or after similar activity. Interestingly, recent reports demonstrate that the condition is also seen more and more in completely non-active individuals, making the aetiology ever more difficult to speculate about[4]. Rest may initially decrease the symptoms among active individuals but frequently, symptoms will return with an increase in activity. In a later stage the tendon may become painful during rest and activities of daily living.

On clinical examination, the swelling in the tendon midportion may be obvious. Achilles tendon pain is usually localised to the tendon itself, mainly ventral-deep side, and does not refer to other regions. In the presence of swelling with pain on palpation there is a high probability that histology will show features of tendinosis[1].

ADDITIONAL DIAGNOSTICS

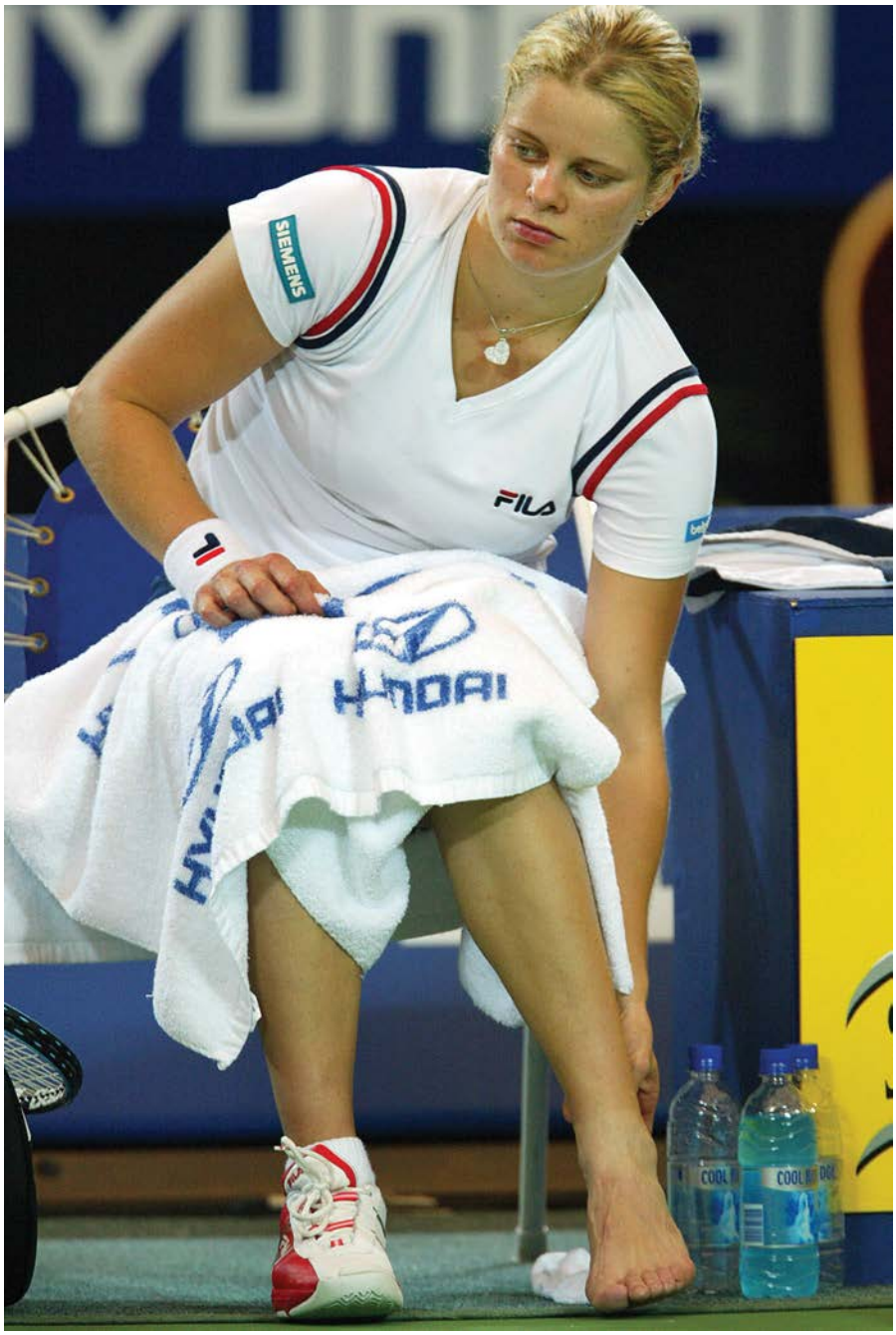
There are several modalities available for imaging of the Achilles tendon. Ultrasonography provides several benefits in comparison with magnetic resonance imaging (MRI). It is readily accessible, quick and patient friendly with the possibility of interaction with the patient. Moreover, the addition of Power Doppler can be helpful in examining the blood flow within and around the tendon[5]. The major ultrasonographic findings in chronic midportion Achilles tendinopathy are tendon thickening, hypoechoic areas, disorganised tendon tissue structure and increased Power Doppler flow. This increased blood flow is also described as 'neovascularisation', referring to the

formation of new blood vessels. There is still discussion about the presence and significance of tendon structure disorganisation and neovascularisation in chronic tendinopathy and the relation with the patient's symptoms[5].

MRI provides good quality images of the Achilles tendon due to the three-dimensional view and the excellent soft-tissue contrast imaging. The MRI appearance of a normal healthy tendon is dark with compact and parallel arrangement of the collagen with low intrinsic water contents, whereas pathologic conditions of the tendon are well-recognised through tendon thickening or an abnormal increase in water signal. It is known that a lesser extent of signal abnormalities is associated with a better prognosis[7]. Using MRI blood flow cannot be evaluated.

TREATMENT OPTIONS

The treatment of tendinopathy has changed considerably in recent years due to increased knowledge about the underlying pathology. Nonetheless, the treatment of choice can vary from country to country, from clinic to clinic and from clinician to clinician.



Decades ago, rest was initially recommended due to the lack of a reasonable alternative. Rest can have an effect on symptoms, but it appeared to affect tendon tissue negatively by reducing the collagen amount. Later on, non-steroidal anti-inflammatory agents were prescribed. However, due to the shift from the 'inflammatory' to 'degenerative' theory in chronic tendon disorders, these medications have fallen out of favour[1]. The role of local anti-inflammatory corticosteroid injections in the management of Achilles tendinopathy has been widely debated. The effects of corticosteroids in Achilles tendinopathy have only been described in anecdotal reports or based on expert opinion, but no large studies with long-term follow-up have been performed to examine the role of corticosteroid injections. Injections of corticosteroids have been reported to be associated with spontaneous rupture of the Achilles tendon and nowadays these injections are discouraged for the treatment of Achilles tendinopathy.

ECCENTRIC EXERCISES

In 1998, Alfredson and colleagues introduced a heavy load eccentric exercise programme[8]. They reported that ignoring pain, increasing load and performing the exercises slowly during the programme provided better results. In subsequent studies, comparable results were reported with high patient satisfaction. The working mechanisms of eccentric exercises are hypothetical and without scientific evidence. Recent systematic reviews on the clinical effects of eccentric exercise therapy in patients with Achilles tendinopathy showed that the effects on pain are promising, but there is no evidence that there is an improvement in function[9].

Based on these promising results, eccentric exercise therapy is increasingly prescribed for patients with chronic midportion Achilles tendinopathy. When there is a failure after an eccentric exercise programme, there are many proposed conservative treatment options. With the

increasing knowledge on basic science in tendinopathy, new treatment modalities are developing.

POLIDOCANOL INJECTIONS

Based on new histological findings that the nerves were located close to the vessels (region with high blood flow shown with ultrasound + Doppler) outside the tendon, treatment with ultrasound and Doppler-guided injections of the sclerosing substance Polidocanol was introduced in Umeå, Sweden[10,11]. There was often a need for two to three injection treatments with six to eight weeks in between. The results were good, and a high proportion of the patients experienced pain relief and cure. However, the method is technically demanding, very much operator-dependant with a long learning curve, making it less suitable for general use. Anyhow, this method has provided good evidence about where the pain comes from in this condition, namely in close relation to regions with high blood flow in the soft tissues on the ventral side of the Achilles. Based on the findings using sclerosing injections, the Umeå group instead introduced a mini-surgical approach, ultrasound and Doppler-guided scraping, were the regions with high blood flow and multiple nerves outside the tendon were scraped loose from the ventral tendon[12]. This was a one-stage procedure, allowing for a fast (3 to 6 weeks) return to full tendon loading activity. The clinical results, now having 3 to 4 years follow ups, are very good. There are few complications, high level athletes can go back to full loading early and the tendon is shown to remodel and return to a more normal size and structure.

Image: Qatari Saif Saaeed, two-time 3000m steeplechase world champion, pulled out of the Asian Games 2006, due to an Achilles tendon injury

> ***They reported that ignoring pain, increasing load and performing eccentric exercises slowly provided better results***

PLANTARIS TENDON RELEASE

Recently, the importance of a close by located plantaris tendon was highlighted[13]. Especially in patients with pain located on the medial side of the Achilles midportion, a thickened plantaris tendon was found to be located close to (sometimes more or less invaginated into) the Achilles. Normally the thin plantaris tendon is located about 1 cm away from the medial Achilles, but in 10 to 15% of individuals it has been shown to be located very close to the Achilles. The plantaris tendon is thought to mechanically interfere with the Achilles. Release and extirpation of the plantaris tendon, together with the scraping procedure, has shown good clinic results[13]. Histological analysis has shown similar tendinosis changes both in the plantaris and Achilles tendons.

PLATELET RICH PLASMA

In recent years, scientific research and technology in the field of regenerative medicine has provided a new perspective on management of chronic tendon injuries by delivering growth factors in an attempt to initiate tissue healing. One approach to achieve this is the use of platelet-rich plasma (PRP)[14]. Degranulation of platelets leads to a release of various growth factors. Laboratory and equine tendon studies suggested that the in vivo application of PRP can increase tendon fibre synthesis and improve vascularity and that it may be a good treatment option for tendinopathy. A systematic review, however, showed that there was limited evidence for recommending injections with PRP as a treatment for tendinopathy[15]. To assess the effect of a PRP injection in chronic midportion Achilles tendinopathy, a double-blind randomised placebo-controlled clinical trial was recently performed. Improvement in functional outcome scores were equal within the PRP and placebo groups and

clinically relevant differences were not found[16]. Until now, there is no evidence to support PRP injections for chronic tendon injuries.

FUTURE TREATMENT OPTIONS

As stated before, increasing attention is being paid to regenerative medicine in this field. The use of cell therapy is the other novel approach that may induce tendon regeneration. Autologous progenitor tenocytes are demonstrated in different animal studies and found to be capable of inducing tendon tissue regeneration[17]. The theoretical advantages are that the cells could contribute themselves to the healing process because of their potency to differentiate and generate new tissue. In addition, the cells could produce trophic factors (e.g. growth factors and anti-inflammatory cytokines) for a prolonged period, in contrast to a single injection of growth factors. In contrast to mesenchymal stem cells, homologous (progenitor) tenocytes can be harvested relatively easily from another tendon in the human body using a biopsy. A recent animal study showed this autologous tenocytes therapy to be effective in a collagenase induced rabbit Achilles tendinopathy model. A pilot study in patients with tennis elbow proved this technique to be safe and promising (unpublished data). In the Netherlands, a double-blind, prospective randomised clinical single-center study has been started, which compares an injection of cultured autologous tenocytes (derived from the patellar tendon) with a physiological saline injection.

There are many theories and suggested treatments promoting intra-tendinous injection treatments, but we are still waiting on Level I evidence from randomised controlled trials. For the moment, there is more science showing that treatment outside the Achilles tendon (sclerosing Polidocanol injections and mini surgical scraping) is efficient in relieving pain and can remodel and possibly regenerate the tendon. Unfortunately these treatments have not yet been compared with placebo in randomised controlled trials.

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