**Bijlage Literatuuronderzoek Achillespeesruptuur bij zaalvoetbal na jaren springen in zijn werk**

**Uitkomsten van literatuuronderzoek**

AL Achillespees rupturen worden in de literatuur vooral in verband gebracht met sporten en dan met name met recreatiesport. Overbelasting door rennen en springen kan zorgen voor irritatie van de achillespees en door het plotseling optreden van grote krachten op de voet kan de pees daarna afscheuren. Over de invloed van schoeisel is wel geschreven, maar vooral over sportschoenen. Achillespees problemen worden wel gezien bij kunstrijders en daar zou de druk van de schaats wel een rol spelen. Rechtstandig springen geeft een tamelijk grote energiebelasting aan de pees.

PK: Herhaald springen, traplopen en slecht schoeisel worden als mogelijke risicofactor genoemd. Dit geldt ook voor voetbal.

**Referenties**

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Suchak AA, Geoff Bostick, David Reid, Sandra Blitz and Nadr JomhaThe Incidence of Achilles Tendon Ruptures in Edmonton, Canada Foot & Ankle International/Vol. 26, No. 11/November 2005: 932 September AV, et al. Genetic risk factors for Achilles tendon injuries International SportMed Journal Vol.7 No.3, 2006, pp. 201-215

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Sports participation has undergone an increase in recent decades. Injury due to sporting activity has also recently risen. The Achilles tendon has been one of the most common sports-related injuries. A 2 in 100,000 individual Achilles tendon injury rate increased to a 12 in 100,000 individual injury rate in less than 10 years. The injury is typically observed in men in the fourth to fifth decades of life. Male to female injury ratios range from 2:1 to 12:1. Running, jumping, and agility activities involving eccentric loading and explosive plyometric contractions are usual mechanisms. Natural aging allows predisposing chronic degeneration of the tendon. Blood flow decreases and stiffness increases with aging to decrease the ability to withstand stress. Noninflammatory tendinosis and chronic tendinopathy are 2 separate processes proposed for tendon degeneration and subsequent rupture. Rupture typically occurs 2 to 6 cm proximal to the calcaneal insertion. Predisposing factors are grouped into 2 categories: intrinsic and extrinsic risk factors. Avoidance of degenerative changes within the tendon is the primary method to prevent rupture. Regular physical activity as athletes age also promotes tendon hypertrophy, increases nutrient delivery, and reduces collagen fiber fatigue.

Porter EB, Young CC, Niedfeldt MW, Gottschlich LM. Sport-specific injuries and medical problems of figure skaters. WMJ. 2007 Sep;106(6):330-4.

Figure skating is becoming increasingly popular as both a recreational and competitive sport. As the number of figure skating participants increases, so will the number of active patients who present to their primary care physician with sport-related injuries and medical problems. Figure skating is a unique sport that continues to evolve and progress with participants partaking in more difficult moves and more rigorous training programs. Common problems in figure skating include acute musculo-skeletal injuries and chronic overuse injuries, which primarily occur in the foot, ankle, knee, leg, hip, and lower back. Figure skaters are also more likely to endure specific medical problems such as exercise-induced bronchospasm and eating disorders. Primary care physicians are able to contribute to their figure skating patient's health by recognition and appropriate treatment of acute injuries and prevention of chronic injuries and other medical problems.

Fukashiro S, Komi PV, Järvinen M, Miyashita M. In vivo Achilles tendon loading during jumping in humans. Eur J Appl Physiol Occup Physiol. 1995;71(5):453-8.

Elastic behaviour of the human tendomuscular system during jumping was investigated by determination of the in vivo Achilles tendon force. A buckle-type transducer was implanted under local anaesthesia around the right Achilles tendon of an adult subject. After calibration, the Achilles tendon force was recorded together with the triceps surae muscle electromyogram activity and high speed filming and ground reaction force during: a maximal vertical jump from a squat position, a maximal vertical jump from an erect standing position with a preliminary counter-movement, and repetitive submaximal hopping on the spot. Jumping heights were 33, 40 and 7 cm in the squat, the counter movement and the hopping positions, respectively. The peak Achilles tendon force and mechanical work by the calf muscles were 2233 N and 34 J in the squat jump, 1895 N and 27 J in the counter movement jump, and 3786 N and 51 J when hopping. The changes in tendon length were estimated assuming a stiffness constant calculated from the tendon architecture. The percentages of elastic energy stored in the Achilles tendon during jumping were 23%, 17% and 34% of the total calf muscle work in the squat jump, the counter movement jump, and hopping, respectively.

Fernández-Palazzi F, Rivas S, Mujica P. **Achilles tendinitis in ballet dancers.** Clin Orthop Relat Res. 1990 Aug;(257):257-61.

Overuse injuries of tendons are known to occur in persons whose activities submit the tendon to excessive stress. Classical ballet dancers performing en pointe, demie point, or plié exert forces that, although normal in magnitude, are increased in frequency, thus overusing the Achilles tendon. In the present study all cases of Achilles tendinopathy seen in a period of three years in three ballet companies were reviewed by a special orthopedic clinic. The cause, whether by abnormal tension or incorrect use, development, and progression to chronic tendinopathy, as well as measures to prevent it, were analyzed in 19 cases. The methods of treatment, including conservative treatment with rest and refraining from dancing, local treatment such as ice and adhesive strapping, antiinflammatory drugs, local injections, thermotherapy, and laser therapy, were compared, and the time of recovery and ability to resume dancing were evaluated. Two cases required surgical treatment to subside, and the patients had to retire from professional dancing. The roentgenographic diagnosis of stage and progression of the tendinopathy is emphasized as a valuable accessory sign. The similarity in lesions between Achilles and patellar tendon problems was observed and confirmed.

Józsa L, Kvist M, Bálint BJ, Reffy A, Järvinen M, Lehto M, Barzo M. **The role of recreational sport activity in Achilles tendon rupture. A clinical, pathoanatomical, and sociological study of 292 cases.** Am J Sports Med. 1989 May-Jun;17(3):338-43.

During the last few decades, the incidence of tendon ruptures has increased in civilized countries. Our material comprises 749 patients who had 832 tendon ruptures treated surgically between 1972 and 1985. There were no competitive athletes among the patients studied. There were 292 single ruptures of the Achilles tendon, 274 of the proximal biceps brachii, 113 of the extensor pollicis longus, and 70 of other tendons. Forty-eight patients had multiple ruptures and 35 patients had re-ruptures. Achilles tendon ruptures often occurred in recreational sports activities (59%), in contrast to other tendon ruptures (2%; P less than 0.001). The mean age for patients who had Achilles tendon rupture was 35.2 years and for patients with other ruptures, 50.7 years (P less than 0.001). There was a connection between the high incidence of blood group O and tendon ruptures (P less than 0.001). In cases of multiple ruptures and re-ruptures, the frequency of blood group O was 71%. Sixty-two point three percent of the patients with Achilles tendon rupture were professionals or white collar workers, which is markedly more than in the Hungarian population (12.7%; P less than 0.001). Two hundred and six Achilles tendon ruptures were studied histologically, and all cases displayed pathological alterations. The results indicate that complete rupture of the Achilles tendon is usually a sequel to a sedentary life-style and participation in sports activities.