

# **Acute Achilles Tendon Rupture: The impact of calf muscle performance on function and recovery**

## **Akademisk avhandling**

som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligen försvaras i hörsal Arvid Carlsson, Academicum, Medicinargatan 3, Göteborg, fredagen den 15 december 2017, klockan 09.00

av

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## **Avhandlingen baseras på följande delarbeten**

- I. Brorsson A, Silbernagel KG, Olsson N, Nilsson Helander K (2017).  
**Calf muscle performance deficits remain 7 years after an Achilles tendon rupture.**  
Am J Sports Med. doi: 10.1177/0363546517737055.
- II. Brorsson A, Olsson N, Nilsson-Helander K, Karlsson J, Eriksson BI, Silbernagel KG (2016).  
**Recovery of calf muscle endurance 3 months after an Achilles tendon rupture.**  
Scand J Med Sci Sports;26(7):844-853.
- III. Silbernagel KG, Brorsson A, Olsson N, Eriksson BI, Karlsson J, Nilsson-Helander K (2015).  
**Sex differences in outcome after an acute Achilles tendon rupture.**  
Orthop J Sports Med 3(6):2325967115586768. eCollection 2015.
- IV. Brorsson A, Willy RW, Tranberg R, Silbernagel KG (2017).  
**Heel-rise height deficit 1 year after Achilles tendon rupture relates to changes in ankle biomechanics 6 years after injury.**  
Am J Sports Med. doi: 10.1177/0363546517717698.

**SAHLGRENKA AKADEMIN  
INSTITUTIONEN FÖR KLINISKA VETENSKAPER**



# Acute Achilles Tendon Rupture: The impact of calf muscle performance on function and recovery

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## Abstract

There is an ongoing debate about the optimal treatment for patients with an acute Achilles tendon rupture. The overall purpose of this thesis was to acquire a greater knowledge of the way patients recover at different time points after the injury when treated with the currently recommended treatment protocols. This knowledge will then form the basis of the further development of treatment strategies with the ultimate goal of minimizing the risk of permanent disability after an Achilles tendon rupture.

In Study I, a long-term follow-up of 66 patients included in a randomized, controlled trial revealed that, 7 years after the injury, there were continuing deficits in calf muscle endurance and strength. There was no continued improvement in calf muscle performance after the 2-year follow-up, apart from heel-rise height.

Study II, a clinical prospective comparative study of a cohort of 93 patients, performed 3 months after the injury, concluded that standardized seated heel-rises were a safe and useful tool for evaluating calf muscle endurance and predicting future function and patient-reported symptoms. No differences in early calf muscle recovery were found between patients treated with surgery and patients treated with non-surgery, but the question of whether women recovered in the same way as men remained unanswered.

In Study III, a clinical retrospective comparative study comprising 182 patients, it was found that female patients had a greater degree of deficit in heel-rise height compared with males, irrespective of treatment. Females had more symptoms after surgery, at both 6 and 12 months, but this difference was not found in non-surgically treated female patients.

In Study IV, the effect of continued heel-rise height deficits on biomechanics during walking, running and jumping was further evaluated. This study revealed that heel-rise height, obtained during the single-leg standing heel-rise test, performed 1 year after the injury, was related to the long-term ability to regain normal ankle biomechanics. In this cross-sectional study, comprising 34 patients, the conclusion was drawn that minimizing tendon elongation and regaining heel-rise height may be important for the long-term recovery of ankle biomechanics, particularly during more demanding activities such as jumping.

This thesis shows that the early recovery of heel-rise height and calf muscle endurance has a significant impact on lower leg function and patient-reported outcome in the long term after an acute Achilles tendon rupture. No differences in early or late calf muscle recovery were found between patients treated with surgery and patients treated with non-surgery. Furthermore, it is concluded that females have more symptoms after surgery, but this difference is not found in non-surgically treated female patients. This knowledge could now form a new basis for developing more effective, individualized treatment protocols with the aim of optimizing the treatment after an acute Achilles tendon rupture.

**Keywords:** Achilles tendon rupture, Rehabilitation, Heel-rise, Function, Recovery, Calf muscle, Ankle biomechanics, Endurance, Jump, Sex differences