Web appendix 1 – Information brochure exercise program and return to sport

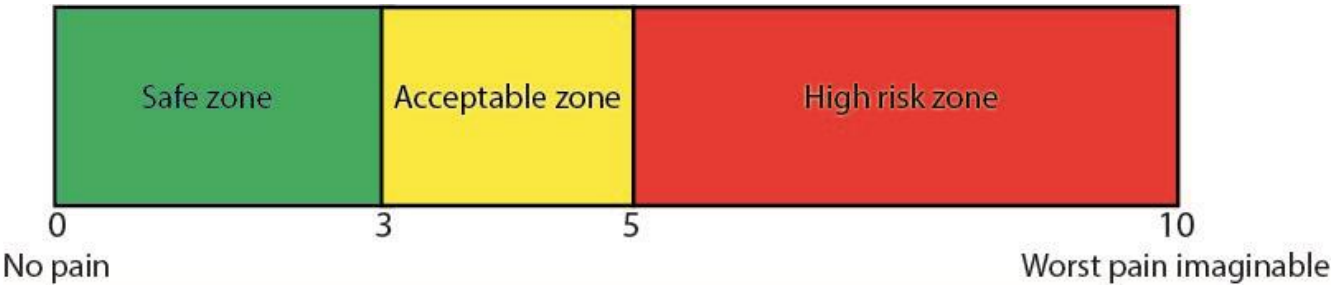
Exercise therapy

Why exercise therapy?

Exercise therapy is an effective treatment option in patients with an overuse injury of the Achilles tendon. The aim of the first phase of the exercise program is to reduce pain symptoms. The aim of the next phase is to gradually strengthen the calf muscles. Next, the tendon cells will be stimulated to produce more tendon fibres by performing eccentric exercises.

Pain during the exercise program?

The exercises may induce muscle soreness, however, there should only be mild discomfort during the exercise. This is assessed using a pain scale, in which with 0 indices no pain and 10 indicates maximum pain. A maximum pain score of 3 is accepted during and/or after the performance of the exercises. If the exercises provoke more pain and the symptoms persist after the performance of the exercises, the intensity of the exercises should be reduced by performing fewer repetitions and/or by reducing additional weight. If this does not resolve symptoms to its previous level, the specific exercises should be ceased temporarily. We advise continuing the exercises that can be performed without pain.



Phases exercise program

Previously exercises were performed as heavy as possible and to train with symptoms of pain. Recent research shows that a gradual increase in training load is more effective to reduce symptoms of pain. The gradual increase is making it less likely that the Achilles tendon will be symptomatic again and this will optimize the speed of recovery. The exercise therapy consists of 4 different phases. Phase 1 takes 1 to 2 weeks and mainly consists of exercises to improve mobility of the ankle and isometric exercises of the calf muscle. During these exercises the muscle contracts, but the muscle doesn't change length. Phase 2 takes 1 to 4 weeks and consists mainly of concentric exercises. During these exercises the muscle contracts and shortens. Phase 3 takes 1 to 10 weeks and consists mainly of eccentric exercises. During these exercises the muscle contracts and lengthens. These are heavy exercises for both the calf muscle and the Achilles tendon.

As stated above, the duration of the exercise program is very variable. It could be that the exercise program takes 3 weeks, however, it could also take 24 weeks. This depends on the severity of symptoms during and after the performance of the exercises. An increase in pain during the performance of the exercises or an increase in morning stiffness the day after the exercises compared to the days before are signs to decrease the intensity of the exercises. The first step is to stop the performance of the exercises until the symptoms are at the same level as before the symptoms increased. If this is the case, you can continue the exercises that did not provoke symptoms previously ((in other words, we advised to go back to one phase within the program).

We recommend watching the video's on how to perform the different exercises at www.achillespeesonderzoek.nl.

Exercises phase I (week 1-2)

1. Isometric exercises calf muscle (knee straight)

Perform this exercise without shoes or on shoes with flexible soles. Stand on the toes of one foot. Do not use your arms, unless this is necessary for coordination. Keep the knee straight during the entire exercise and maintain the same position while standing on the toes. Remain this position for 45 seconds and rest for 2 minutes subsequently.
Increase the intensity of the exercise by adding weight if exercises can be performed easily. Use a backpack with weights in it or use a standing calf raise machine in the gym. Start with a maximum of 5 kg and gradually increase the amount of additional weight.

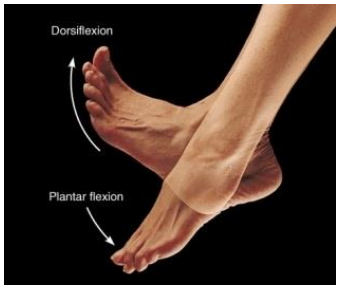
1x/day 5x45 seconds

2. Isometric exercises calf muscle (knee bent)

Perform this exercise in a seated position with the knees bent at 90 degrees. Stand on the toes of both feet and keep the knee bent during the entire exercise. Remain the same position while standing on the toes. Remain this position for 45 seconds and rest for 2 minutes subsequently.
Increase the intensity of the exercise by adding weight if exercises can be performed easily. Use a backpack with weights in it or use a seated calf raise machine in the gym. Start with a maximum of 5 kg and gradually increase the amount of additional weight.

1x/day 5x45 seconds

3. Mobility exercises ankle



Perform this exercise in a seated position with the legs in a relaxed position over the edge of a table. Move the toes at slow speed to the nose and subsequently to the ground. Perform this exercise with both feet at the same time. Try to reach the end position of the ankle joint. Rest for 30 seconds between the exercises.

1x/day 5x1 minute

4. Stretching exercises calf muscle (knee straight)

Perform this exercise in a standing position. Place your hands on the wall to stay balanced. Place the leg that you want to stretch at the back, let the heel stay in contact with the ground, and remain the straight position of the knee. Subsequently, flex the ankle as far as possible. You should feel the stretch on the calf muscle. Remain this position for 30 seconds.

1x/day 3x30 seconds

5. Stretching exercises calf muscle (knee bent)

Perform this exercise in a standing position. Place your hands on the wall to stay balanced. Place the leg that you want to stretch in front near the wall. Let the heel stay in contact with the ground and flex the ankle as far as possible. The knee will move towards the wall when performing this exercise. Remain this position for 30 seconds.

1x/day 3x30 seconds

Exercises phase 2 (week 2-5)

1. Concentric exercises calf muscle (knee straight)

Perform this exercise without shoes or on shoes with flexible soles. Stand on the toes of both feet at a flat surface. Keep the knee straight during the entire exercise in which heel-lifts are performed. Perform the heel-lift and the decline phase at the same speed (1-2 seconds per phase). If the exercises can be performed easily, the exercise can be performed on one leg. If so, perform the heel-lift on the affected leg and the decline phase on both feet. Do not use your arms, unless this I necessary for coordination.

Increase the intensity of the exercise by adding weight if exercises can be performed easily. Use a backpack with weights in it or use a standing calf raise machine in the gym. Start with a maximum of 5 kg and gradually increase the amount of additional weight.

1x/day 3x15 repetitions

2. Concentric exercises calf muscle (knee bent)

Perform this exercise in a seated position with the knees bent at 90 degrees. Perform a heel-lift on both feet and subsequently bring the heel back to the ground. Perform the heel-lift and the decline phase at the same speed (1-2 seconds per phase).

Increase the intensity of the exercise by adding weight if exercises can be performed easily. Use a backpack with weights in it or use a seated calf raise machine in the gym. Start with a maximum of 5 kg and gradually increase the amount of additional weight.

1x/day 3x15 repetitions

3. Stretching exercises calf muscle

Perform the same stretching exercises as described in phase 1. Perform both the exercises with the knee straight and with the knee bent.

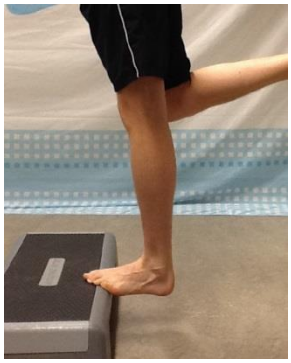
1x/day 3x30 seconds

Exercises phase 3 (week 3-24)

1. Eccentric calf muscle exercises (knee straight)

Perform this exercise without shoes or on shoes with flexible soles. Stand with the forefoot on the edge of a step and perform a toe-raise on both feet. Subsequently, lower yourself down as far as possible on the affected leg only. Then perform the heel-lift on both feet. The decline phase of this exercise should be performed at slow speed: lower yourself down in 3-4 seconds.
Increase the intensity of the exercise by adding weight if exercises can be performed easily. Use a backpack with weights in it or use a standing calf raise machine in the gym. Start with a maximum of 5 kg and gradually increase the amount of additional weight.

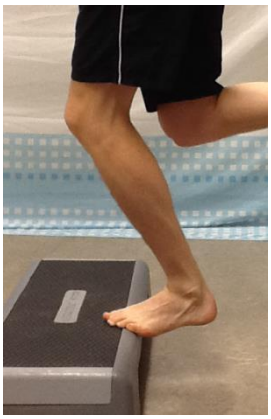
1x/day 3x15 repetitions



2. Eccentric calf muscle exercises (knee slightly bent)

Perform this exercise without shoes or on shoes with flexible soles. Stand with the forefoot on the edge of a step and perform a toe-raise on both feet. Slightly bent the knee 20-30 degrees. Subsequently, lower yourself down as far as possible on the affected leg only and remain the flexed position of the knee. Then perform the heel-lift on both feet. The decline phase of this exercise should be performed at slow speed: lower yourself down in 3-4 seconds.
Increase the intensity of the exercise by adding weight if exercises can be performed easily. Use a backpack with weights in it or use a standing calf raise machine in the gym. Start with a maximum of 5 kg and gradually increase the amount of additional weight.

1x/day 3x15 repetitions



3. Stretching exercises calf muscle

Perform the same stretching exercises as described in phase 1. Perform both the exercises with the knee straight and with the knee bent.

1x/day 3x30 seconds

How to continue?

After the performance of these phases consisting of calf muscle exercises, it is not necessary to perform the exercises daily. We advise continuing the eccentric exercises (phase 3) 3 times per week to prevent the recurrence of symptoms. Also, perform the stretching exercises of the calf muscle at every training session.

Return to sport module

Why a gradual return to sport?

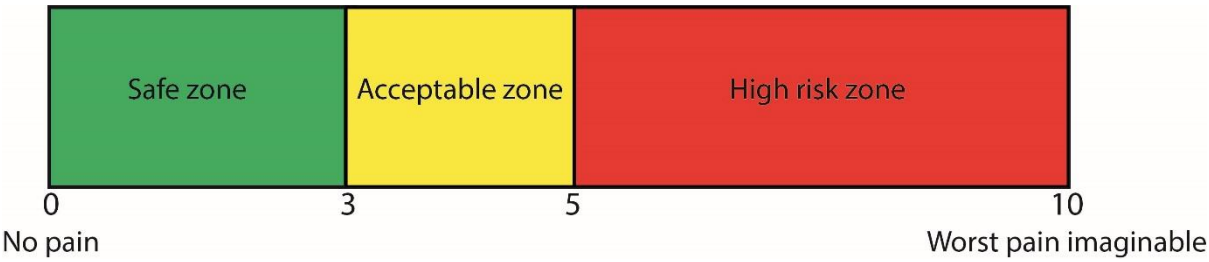
Most athletes aim to return to sport as fast as possible. We would, however, advise to gradually return to sport, to prevent the recurrence of symptoms and to prevent other musculoskeletal injuries. Recent research showed that a quick return to sport leads to a higher chance of recurring symptoms. Symptoms recur in most cases since the reaction of a high training load is only being noticed after the performance of a training session. Therefore, it is important to monitor symptoms (pain and stiffness) and adjust the training schedule if necessary.

Sports activity during the exercise program?

Do not perform activities that provoke pain during the first 3 weeks of the exercise program. Some activities can be performed without pain in most cases. Examples of this kind of activities are hiking, cycling, swimming, weight training of the upper body, or cross-training. We advise to not perform any Achilles tendon-loading sports (e.g. running, soccer, ice skating) in this phase. After 3 weeks of the exercise program, it is possible to gradually increase sports activities provided that there are no or only limited symptoms in daily activities.

Structure of return to sport module

The performance of Achilles tendon-loading sports will be gradually increased with the use of a pain scale, in which 0 indices no pain and 10 indicates maximum pain. A maximum pain score of 3 is accepted during and/or after the performance of the sports activities. This is also referred to as the safe zone. If the sports activities provoke more pain than a score of 3, we advise ceasing the activity. If you notice an increase in symptoms after the performance of sports activity, we advise 2 resting days if the pain is in the 'acceptable zone' and 3 resting days if pain is in the 'high-risk zone'. When the sports activities provoke more pain than a score of 3, we advise adjusting the following training session to the level of the last training session that could be performed in the 'safe zone'.



The return to sport module starts with exercises that will prepare you for running. These exercises will train the Achilles tendon for the forces that have to be handled during running. These exercises will take 2 weeks before the running scheme will start. The exercises are described in phase 1. You can start with module 2 if the exercises in module 1 can be performed without pain during and after the performance of the exercises. Module 2 consists of a gradual increase in running. For runners, it is generally sufficient to return to their sports activities without symptoms when modules 1 and 2 are accomplished. For Achilles tendon-loading sports in which there are changes in direction and accelerations (e.g. Soccer or hockey), it is useful to perform module 3 additionally. You can start module 3 if running is possible for 15 minutes without symptoms.

We recommend watching the video's on how to perform the different exercises at www.achillespeesonderzoek.nl.

Module 1

After the performance of the exercise program, you can start with exercises that will prepare you for running. These exercises are plyometric exercises, which aim to train the energy storage of muscle- and tendon structures. This phase will have a duration of at least 2 weeks (1 week per exercise), depending on the symptoms of the Achilles tendon.

1. Simple plyometric exercises

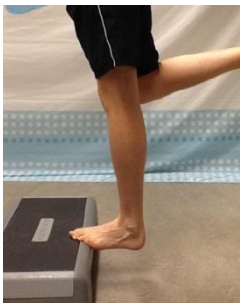
Perform this exercise with running shoes and stand on both feet. Subsequently, use both feet to jump and to get slightly loose from the floor. Try to perform this exercise light-footed (as with a jump rope). It is important to bent the knees increasingly when landing.

Week 1: 1x/day 15 repetitions and increase repetitions with 5 per day

2. Fast plyometric exercises (knee straigth)

Perform this exercise without shoes or on shoes with flexible soles. Stand with the forefoot on the edge of a step and perform a toe-raise on both feet. Subsequently, lower yourself down as far as possible on the affected leg only with the knee straight. Then, perform a heel-lift with high speed. The decline phase of this exercise should be performed at slow speed: lower yourself down in 3-4 seconds.

Week 2: 1x/day 15 repetitions and increase repetitions with 5 per day



3. Fast plyometric exercises (knee bent)

Perform this exercise without shoes or on shoes with flexible soles. Stand with the forefoot on the edge of a step and perform a toe-raise on both feet. Slightly bent the knee 20-30 degrees. Subsequently, lower yourself down as far as possible on the affected leg only with the knee straight. Then, perform a heel-lift with high speed. The decline phase of this exercise should be performed at slow speed: lower yourself down in 3-4 seconds.

Week 2: 1x/day 15 repetitions and increase repetitions with 5 per day

Module 2

When module 1 can be performed without pain during or after the performance of the exercises, you can start with module 2. Module 2 consists of a gradual increase in running starting with running short distances with rest in between. Between the running series, 1 minute of active rest (hiking) is recommended. The goal of module 2 is the complete recovery of symptoms during running.

4. Running

Start with running at a moderate pace of approximately 50% of your maximal pace. Use the running scheme below to gradually increase running. Use the occurrence of symptoms also as a marker of the increase in running distance.

Running scheme
Hike for 1 minute between series to rest

Week	Day	Training
1	Day 1	2x3 min
	Day 3	3x3 min
	Day 5	4x3 min
2	Day 1	2x4 min
	Day 3	2x5 min
	Day 5	10 min
3	Day 1	2x6 min
	Day 3	10+5 min
	Day 5	15 min
4	Day 1	3x5 min
	Day 3	12+8 min
	Day 5	20 min
5	Day 1	6x2 min
	Day 3	15+10+5 min
	Day 5	25 min
6	Day 1	10x1 min
	Day 3	2x15 min
	Day 5	30 min/5 km

Module 3

Module 3 can be performed additionally to further improve symptoms when performing team sports or sports activities in which changes in direction and accelerations are being performed. You can start module 3 if running is possible for 15 minutes without symptoms.

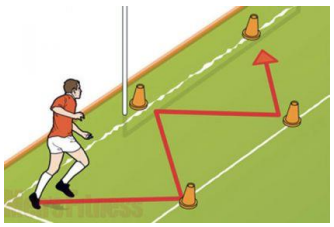
1. Interval running (at slow pace)

Increase these running exercises in number of repetitions and speed to 60% of the maximal sprinting pace. You can start with the interval exercises straight ahead, in which you accelerate for 5 meters, run for 30 meters, and decelerate for 5 meters. If this can be performed without symptoms, start zig-zag runs at the same pace (maximal 60% of sprinting pace). Use 6 training cones to create a zig-zag pattern.

10x30 meter interval (max 60%)

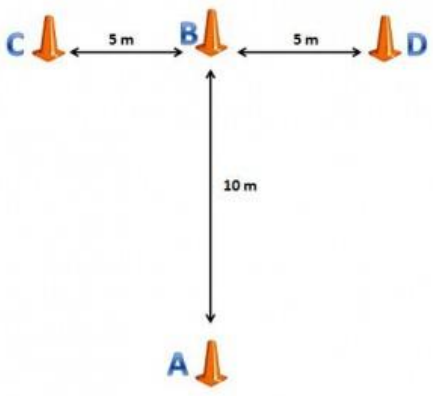
2x3 repetitions 'zig-zag runs' (max 60%)

BE AWARE: The criteria mentioned above are the final criteria and not to start with.



2. Interval running (progressive pace)

Increase these running exercises in number of repetitions and speed to 80% of the maximal sprinting pace. You can start with the interval exercises straight ahead, in which you accelerate for 5 meters, run for 30 meters, and decelerate for 5 meters. If this can be performed without symptoms, start zig-zag runs and agility T-



tests at the same pace (maximal 80% of sprinting pace). When performing the agility T-test (see figure), first run straight ahead from cone A to B and touch this one with your hand. Subsequently, move sideways to cone C and D. Return to cone B and move backwards to cone A. Touch all cones with your hand if you reach them.

10x30 meter interval (max 80%)
2x3 repetitions 'zig-zag runs' (max 80%)
2x3 repetitions 'T-test' (max 80%)

BE AWARE: Start with these exercises if the exercises at 60% of the maximal sprinting pace can be performed without symptoms. Increase the pace of the exercises with maximally 10% per training session. The criteria mentioned above are the final criteria and not to start with.

3. Interval running (maximal sprinting pace)

Increase these running exercises in number of repetitions and speed to 100% of the maximal sprinting pace. You can start with the interval exercises straight ahead, in which you accelerate for 5 meters, run for 30 meters, and decelerate for 5 meters. If this can be performed without symptoms, start zig-zag runs and agility T-tests at the same pace (100% of sprinting pace).

10x30 meter interval (maximal)
2x3 repetitions 'zig-zag runs' (maximal)
2x3 repetitions 'T-test' (maximal)

BE AWARE: Start with these exercises if the exercises at 80% of the maximal sprinting pace can be performed without symptoms. Increase the pace of the exercises with maximally 10% per training session until 90% of the maximal sprinting pace and subsequently with 5% per training session until maximal sprinting pace. The criteria mentioned above are the final criteria and not to start with.

Return to group training

The final phase before return to match play is return to group training. Normally it takes 3 group training sessions without symptoms to return to match play. Increase the return to match play gradually.

Web appendix 2 – Methods and results secondary outcome measures

Methods

The degree of ultrasonographic Doppler flow is assessed with the modified Öhberg score. This is a 5-point grading scale to score neovascularization in various types of tendinopathy; 0 indicates the absence of Doppler flow, 1+ indicates 1-2 neovessels in the Kager's fat pad, 2+ indicates 1-2 neovessels intratendinous, 3+ indicates 3-4 neovessels intratendinous and 4+ indicates a network of neovascularization with more than 5 intratendinous neovessels.[1-3]

The visual analogue sale on the 10-hop test is a clinical test in which patients perform ten hops on their affected limb. Subsequently, their VAS score was noted using a VAS ruler with slider. The VAS score ranges from 0 to 100, with 0 indicating no pain and 100 maximum pain.

The flexibility of the gastrocnemius and soleus muscles were determined using a plurimeter (Dr. Rippstein, La Conversion, Switzerland). Patients were instructed to stretch their calf muscle with an extended knee as much as possible for the gastrocnemius muscle and with 45 degrees of flexion for the soleus muscle. The plurimeter was positioned on the ventral side of the tibia 10 cm above the lateral and medial malleolus.

Power of the calf muscles is measured using a hand-held dynamometer (MicroFET2, Hoggan Health industries). The power of the m. gastrocnemius was measured in prone lying position with the ankle over the edge of the examination table and the power of the m. soleus was measured in a kneeing position with the hands on the chest facing away from the researcher. Patients were instructed to gradually increase force over a 2 second period, and subsequently give maximum power for 5 seconds. The best of three measurements was used for data analysis.

The pain coping inventory is a validated questionnaire to determine the level of active and passive coping.[4] Patients rate 33 items on a 4-point Likert scale ranging from 1 (hardly ever) to 4 (very often). The items were used to calculate the sum of the non-weighted score of their corresponding domains (active/passive). Active coping consisted of the domains transformation, distraction and reducing demands, passive coping of the domains retreating, worrying and resting. The score ranges from 0 to 1, where a score closest to 1 represents a high level of active or passive coping.

The painDETECT questionnaire is a validated tool to detect neuropathic pain components and has a maximum possible score of 38 points.[5] A higher score indicates an increased risk of neuropathic pain.

The patient acceptable symptom state is defined as the highest level of symptom beyond which patients consider themselves well.[6] Patients were asked to rate whether their current symptoms were 1) acceptable or 2) not acceptable if they had to live with the current condition for the rest of their life.

		HVI group (n=39)	Placebo group (n=41)	Adjusted between-group difference
Secondary outcome measures (GEE model)				
Degree ultrasonographic Doppler flow, estimated mean (95% CI)[1]				
	Baseline	2.8 (2.4 to 3.3)	3.2 (2.8 to 3.7)	-0.4 (-1.3 to 0.5)
	2 weeks	3.3 (2.8 to 3.7)	3.5 (3.1 to 3.9)	-0.2 (-1.1 to 0.6)
	6 weeks	3.2 (2.7 to 3.7)	3.4 (3.0 to 3.9)	-0.2 (-1.2 to 0.7)
	12 weeks	3.1 (2.6 to 3.7)	3.4 (3.0 to 3.9)	-0.3 (-1.3 to 0.7)
	24 weeks	2.9 (2.4 to 3.4)	3.2 (2.8 to 3.7)	-0.3 (-1.3 to 0.7)
Visual analogue scale on 10-hop test, estimated mean (95% CI)[1]				
	Baseline	54.7 (41.5 to 67.9)	66.6 (51.4 to 81.7)	-11.9 (-38.9 to 15.2)
	2 weeks	56.3 (40.6 to 72.1)	61.5 (45.0 to 78.0)	-5.2 (-34.3 to 24.0)
	6 weeks	49.2 (31.3 to 67.0)	49.6 (33.6 to 65.6)	-0.4 (-31.8 to 31.0)
	12 weeks	35.1 (21.2 to 48.9)	43.6 (27.2 to 60.0)	-8.5 (-36.2 to 19.2)
	24 weeks	26.7 (11.4 to 42.0)	40.6 (24.1 to 57.1)	-13.9 (-43.7 to 15.8)
Flexibility m. gastrocnemius, degrees, estimated mean (95% CI)[1]				
	Baseline	41.5 (39.3 to 43.6)	41.3 (38.8 to 43.8)	0.2 (-4.9 to 5.4)
	2 weeks	43.2 (40.7 to 45.8)	41.5 (38.9 to 44.1)	1.7 (-4.0 to 7.5)
	6 weeks	43.3 (41.1 to 45.5)	42.1 (39.6 to 44.6)	1.2 (-4.0 to 6.4)
	12 weeks	43.3 (41.3 to 45.3)	41.2 (38.6 to 43.9)	2.0 (-3.3 to 7.4)
	24 weeks	43.4 (41.4 to 45.4)	42.7 (40.4 to 45.0)	0.7 (-4.2 to 5.5)
Flexibility m. soleus, degrees, estimated mean (95% CI)[1]				
	Baseline	42.1 (39.8 to 44.5)	40.9 (38.4 to 43.5)	1.2 (-3.9 to 6.2)
	2 weeks	42.7 (40.4 to 45.0)	42.1 (39.2 to 45.1)	0.5 (-5.0 to 6.0)
	6 weeks	43.0 (40.6 to 45.4)	42.9 (40.1 to 45.6)	0.2 (-5.3 to 5.6)
	12 weeks	43.0 (40.8 to 45.3)	42.4 (39.5 to 45.3)	0.7 (-4.8 to 6.1)
	24 weeks	43.2 (40.9 to 45.5)	43.0 (40.4 to 45.7)	0.2 (-4.9 to 5.2)
Power m. gastrocnemius, Newton, estimated mean (95% CI)[1]				
	Baseline	411 (376 to 445)	416 (380 to 452)	-5 (-69 to 58)
	2 weeks	413 (374 to 451)	423 (387 to 460)	-11 (-85 to 63)
	6 weeks	389 (351 to 428)	430 (389 to 470)	-40 (-117 to 36)
	12 weeks	388 (348 to 428)	411 (370 to 452)	-22 (-102 to 57)
	24 weeks	400 (359 to 442)	417 (371 to 464)	-17 (-103 to 69)
Power m. soleus, Newton, estimated mean (95% CI)[1]				
	Baseline	347 (319 to 374)	353 (320 to 387)	-7 (-67 to 53)
	2 weeks	366 (337 to 394)	375 (343 to 408)	-9 (-69 to 50)

	6 weeks	354 (328 to 381)	378 (344 to 412)	-24 (-82 to 34)
	12 weeks	351 (322 to 379)	383 (353 to 412)	-32 (-90 to 25)
	24 weeks	342 (312 to 372)	375 (338 to 412)	-33 (-100 to 34)
Pain detect questionnaire, estimated mean (95% CI)[1]				
	Baseline	14.6 (12.9 to 16.2)	13.9 (12.3 to 15.4)	-0.7 (-3.5 to 2.1)
	24 weeks	10.0 (8.4 to 11.6)	9.3 (7.4 to 11.3)	0.7 (-2.6 to 4.0)
Pain coping inventory, active coping strategy, estimated mean (95% CI)[1]				
	Baseline	0.52 (0.48 to 0.57)	0.57 (0.53 to 0.61)	-0.05 (-0.12 to 0.03)
	24 weeks	0.45 (0.40 to 0.49)	0.47 (0.43 to 0.52)	-0.03 (-0.11 to 0.05)
Pain coping inventory, passive coping strategy, estimated mean (95% CI)[1]				
	Baseline	0.42 (0.39 to 0.45)	0.45 (0.42 to 0.49)	-0.03 (-0.09 to 0.02)
	24 weeks	0.36 (0.33 to 0.38)	0.38 (0.35 to 0.41)	-0.02 (-0.07 to 0.02)
Secondary outcome measures (Fisher exact test)				
Patient acceptable symptom scale, n (%)[2]				
	Acceptable	22 (59%)	20 (51%)	
	Not acceptable	15 (41%)	19 (49%)	

Abbreviations: CI, confidence interval; HVI, high-volume injection; m., musculus; VISA-A, Victorian Institute of Sports Assessment-Achilles.

[1]The mean estimated modified Öhberg score, visual analogue score 10 hop test, flexibility m. gastrocnemius, flexibility m. soleus, power m. gastrocnemius, power m. soleus, pain detect questionnaire, and pain coping inventory (95% CI) are denoted for the HVI and placebo group. These scores and the adjusted between-group differences were calculated with a generalized Estimation Equations (GEE) with adjustments for the following pre-defined baseline variables: age, sex, BMI, duration of symptoms, and ankle-activity score (AAS). Positive values favour the HVI group. The interaction term treatment group*time point was not statistically significant for all secondary outcome measures investigated using a GEE-model. This means that the course of the VISA-A score over time did not differ between both groups for the following outcome measures: degree ultrasonographic Doppler flow (p=0.95), visual analogue scale on 10-hop test (p=0.34), power m. gastrocnemius (p=0.20), power m. soleus (p=0.19), flexibility m. gastrocnemius (p=0.37), flexibility m. soleus (p=0.66), pain detect questionnaire (p=0.96), pain coping inventory, active coping strategy (p=0.59), and pain coping inventory, passive coping strategy (p=0.67).

[2]The number of patients (%) is denoted for the HVI and placebo group. Two patients were lost to follow-up in each group. No statistically significant differences were found between both treatment groups at 24 weeks for the patient acceptable symptom scale (p=0.50).

[3]Missing data in the GEE-model for the secondary outcomes was: degree ultrasonographic Doppler flow 16%, visual analogue scale on 10-hop test 19%, **f**lexibility m. gastrocnemius 21%, **f**lexibility m. soleus 21%**, p**ower m. gastrocnemius 23%, power m. soleus 25%**,** pain detect questionnaire 12%, pain coping inventory, active coping strategy 7%, pain coping inventory, passive coping strategy 6%. Missing data

values were higher compared to our primary outcome, as we had to decide to not investigate the Doppler flow, flexibility of the calf muscle and power of the calf muscle during follow-up in the last 18 patients included in the study.

Web appendix 3 – Baseline characteristics (extended)

Extended baseline characteristics of the High-volume injection (HVI; intervention) and placebo group.

	HVI group (n= 39)	**Placebo group (n= 41)**
Age, y	46.9 (8.1)	48.9 (9.9)
Sex, male, n (%)	17 (44)	22 (54)
BMI	26.8 (5.7)	27.6 (5.1)
Activity[1]		
Active in sports, n (%)	31 (79)	33 (80)
Sedentary, n (%)	8 (21)	8 (20)
Sports participation in desired sport (total hours per week)	3.9 (2.0)	4.9 (3.6)
Affected side		
Unilateral, left/right, n (%)	11/11 (56)	15/15 (73)
Bilateral, n (%)	17 (44)	11 (27)
Duration of symptoms, wk, median (IQR)	64 (17-112)	60 (14-107)
VISA-A score	44.4 (15.5)	41.0 (16.0)
Previous interventions[2]		
Exercise therapy, n (%)	39 (100)	41 (100)
Foot orthoses, n (%)	6 (15)	12 (29)
Night splint, n (%)	6 (15)	2 (5)
Shockwave therapy, n (%)	16 (41)	19 (46)
Acupuncture/dry-needling, n (%)	7 (18)	9 (22)
Laser therapy/EPTE, n (%)	3 (8)	4 (10)
Injection therapy, n (%)	4 (10)	4 (10)
Interventions at the time of study commencement		
None, n (%)	24 (62)	19 (46)
Night splint, n (%)	1 (3)	0 (0)
Foot orthoses, n (%)	10 (26)	18 (44)
Pain killers, n (%)	1 (3)	4 (10)
Others, n (%)	3 (8)	1 (2)
Doppler flow		
Intratendinous, n (%)	33 (85)	37 (90)
Peritendinous, n (%)	6 (15)	4 (10)

Data are presented as mean ± SD unless otherwise specified.
Abbreviations: BMI, body mass index; IQR, interquartile range; n, number of participants; SD, standard deviation; VISA-A, Victorian Institute of Sports Assessment-Achilles; wk, weeks; y, years.

[1] To determine whether participants were active in sports or sedentary we used the ankle-activity score. If the score was ≥4 points the participant was considered to be active in sports (starting from physical work). If the score was ≤3 points the participant was considered to be sedentary (cycling, equestrian or less activity). Level of sport and sports participation is only presented for the active group.
[2] Exercise therapy was performed for a minimum of 6 weeks. Injection therapies that patients received were platelet-rich plasma injections, prolotherapy injections, and corticosteroid injections.

Web appendix 4 – Additional analysis to determine whether disappearance of Doppler flow after the injection procedure in the HVI group influenced the course of the VISA-A score over time.

		Succes of HVI (n=31)	No success of HVI (n=8)	Adjusted between-group difference
VISA-A score, estimated mean (95% CI)[1]				
	Baseline	40.6 (32.9 to 48.4)	35.8 (24.5 to 47.2)	4.8 (-11.2 to 20.8)
	2 weeks	41.3 (33.7 to 48.9)	37.5 (26.4 to 48.6)	3.8 (-12.6 to 20.1)
	6 weeks	46.9 (38.1 to 55.6)	42.1 (30.9 to 53.3)	4.8 (-13.5 to 23.0)
	12 weeks	52.6 (44.4 to 60.9)	47.1 (35.6 to 58.7)	5.5 (-12.6 to 23.6)
	24 weeks	60.8 (52.6 to 69.0)	56.1 (44.1 to 68.0)	4.8 (-15.5 to 25.0)

Abbreviations: CI, confidence interval; HVI, high-volume injection; VISA-A, Victorian Institute of Sports Assessment-Achilles.

[1]The mean estimated VISA-A score (95% CI) is denoted for two groups. In the success of HVI group, Doppler flow was no longer present intratendinous. In the no success of HVI group, Doppler flow was still present intratendinous after the injection procedure. The mean estimated VISA-A scores and the adjusted between-group differences were calculated with a generalized Estimation Equations with adjustments for the following pre-defined baseline variables: age, sex, BMI, duration of symptoms, and ankle-activity score (AAS) for the subgroup that received the high-volume injection (intervention group). Positive values favour the HVI group. No statistically significant differences were found between both treatment groups at all time points. The interaction term success of the injection procedure*time point was not statistically significant (p=0.99), meaning that the course of the VISA-A score over time did not differ between both groups.

Web appendix 5 - Primary outcome measure in both treatment groups in the GEE without adjustments for baseline covariates.

		HVI group (n=39)	Placebo group (n=41)	Unadjusted between-group difference
Primary outcome measure				
VISA-A score, estimated mean (95% CI)[1]				
	2 weeks	45.5 (41.1 to 49.8)	42.3 (37.8 to 46.9)	3.2 (-7.3 to 13.7)
	6 weeks	47.5 (41.2 to 53.7)	50.0 (44.5 to 55.6)	-2.5 (-16.4 to 11.4)
	12 weeks	54.9 (48.8 to 61.1)	53.6 (47.7 to 59.5)	1.3 (-12.9 to 15.5)
	24 weeks	63.0 (55.6 to 70.5)	62.6 (56.0 to 69.2)	0.4 (-16.1 to 16.9)

Abbreviations: CI, confidence interval; HVI, high-volume injection; VISA-A, Victorian Institute of Sports Assessment-Achilles.

[1]The mean estimated VISA-A score (95% CI) is denoted for the HVI and placebo group. These scores and the unadjusted between-group differences were calculated with a generalized Estimation Equations without the pre-defined adjustments for (age, sex, BMI, duration of symptoms, and ankle-activity score). Positive values favour the HVI group. No statistically significant differences were found between both treatment groups at all time points.

References web appendices

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