Long-term follow-up after acute achilles tendon rupture — Does treatment strategy influence functional outcomes?

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Title

Long-Term Follow-Up after Acute Achilles Tendon Rupture - Does Treatment Strategy Influence Functional Outcomes?

Abstract

Background: Patients struggle to fully recover after an Achilles tendon rupture. Although several studies has investigated surgical and non-surgical treatment, the best treatment is still uncertain. The aim of this study was to investigate long-term patient-reported outcomes and objective measures 4 years after acute Achilles tendon rupture and compare whether outcomes differed between patients treated on basis of the previous regimen preferring surgical treatment and the new regimen preferring functional rehabilitation.

Methods: Achilles tendon Total Rupture Score (ATRS), number of re-ruptures and the objective measures; Achilles tendon resting angle, calf circumference, heel-rise height, and muscle endurance were measured at a 4-year follow-up. Patients were recruited from Aalborg University Hospital.

Results: Seventy-six patients were included (29% female). The mean ATRS was 71.4 (95% CI: 65.8 to 77.1) at 4 years follow-up. No difference in ATRS was observed between Previous regimen and New regimen at any timepoint (time x group interaction, p=0.8509). The injured side was still significantly impaired compared with the non-injured side in terms of all objective measures. Impairments in objective measures were not dependent on the preferred treatment strategy.

Conclusions: Patient reported impairments and objective functional deficits persist 4 years after an acute Achilles tendon rupture. No differences in patient reported outcome or objective measures at the 4 years follow-up was observed between the

old treatment regimen preferring surgery compared with the new treatment regimen preferring functional rehabilitation.

Keywords

Achilles, functional rehabilitation, rupture, surgery, tendon

Abbreviations

ATRA: Achilles tendon resting angle

ATRS: Acute Achilles tendon rupture score

DADB: Danish Achilles tendon Database

HRH: Heel-rise height

ME: Muscle Endurance

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1. Introduction

1.1 Background

Acute Achilles tendon rupture is a common injury with an incidence of 8 to 37 per 100,000 person years.[1-5] Over the last decades, the incidence has increased,[1,3,5] presumably due to a larger elderly population and their activity level.[6] Previous studies found functional deficits 1-2 years after Achilles tendon rupture,[7,8] but long-term follow-up studies are scarce.

Despite several randomized controlled trials and meta-analyses investigating surgical versus non-surgical treatment of an acute Achilles tendon rupture, the optimal treatment is still uncertain.[9-11] The risk of re-rupture is generally considered lower with surgical treatment compared to non-surgical treatment with immobilization.[12,13] The advantage of non-surgical treatment is the absence of complications due to anesthesia and surgical complications such as risk of infection, nerve injury, scar tissue, and other surgery-related complications.[14,15] Historically, since surgery was introduced, it has been the preferred treatment, but during the last 10 years, the number of non-surgically treated patients has increased.[1,3,5]
The change in treatment appears to have been inspired by publications of randomized controlled trials,[16,17] followed by a meta-analysis showing no difference between surgical and non-surgical treatment regarding re-rupture rate if a functional rehabilitation protocol with early mobilization was followed.[18] These results indicate that rehabilitation is important for the outcome and could be more important than if the rupture is treated surgically or not.

Previously, the ***preferred*** treatment strategy for acute Achilles tendon ruptures in Denmark country was surgical treatment. However, later research evidence has suggested that many patients with acute Achilles tendon ruptures may do well with conservative treatment (i.e. functional rehabilitation). Thus, the ***preferred*** (or recommended) treatment strategy was changed. As part of quality assurance and research, it is important to investigate if such decisions (i.e. to change the preferred treatment strategy) manifest in better or at least similar outcomes compared with the previous strategy. In this study we included patients from a single hospital clinical

database, where the preferred treatment strategy was changed from regimen with surgery as the preferred, to a regimen with functional rehabilitation (non-surgical) as the prefferred treatment to investigate if this impacted the long term outcomes.

1.2 Aim

The aim of this study was to investigate long-term patient-reported outcomes and objective measures 4 years after acute Achilles tendon rupture and compare whether outcomes differed between patients treated on basis of the previous regimen preferring surgical treatment and the new regimen preferring functional rehabilitation.

2. Material and Method

2.1 Materials

Patients included in this long-term follow-up were treated at Aalborg University Hospital and recruited from the Danish Achilles tendon Database (DADB)[19] Long-term follow-up was conducted from 03/2018 to 04/2018. Inclusion criteria were first-time Achilles tendon rupture between 04/2012 and 03/2015, minimum 18 years old at time of rupture, and patients registered in the DADB in Aalborg University Hospital. Exclusion criteria were bilateral rupture, delayed treatment onset (> 14 days), and if patients were not able to participate in testing. Patients were invited through secure e-mail.

2.2 Treatment procedure

The regimens were as described below, but each surgeon could deviate from the regimen if they considered it relevant in the specific case due contraindications, patient preferences or other clinical reasons.

2.2.1 Previous regimen – preferring surgery as first choice treatment

Before November 2013, the primary treatment for Achilles tendon rupture was surgical treatment using open end-to-end sutures. Surgery was performed with the patient in prone position, usually under local anesthesia, otherwise under general or spinal anesthesia. Postoperatively, the patients were placed in a ROM walker for 6 weeks. The ROM walker was locked in 30 degrees plantarflexion for two weeks, followed by 30- to 15-degree range of motion in the third week and 30- to 0-degree range of motion in the last 3 weeks. Severe comorbidities such as diabetes or vascular disease with risk of impaired healing were contraindications to surgical treatment. Patients treated non-surgically were placed in a ROM walker for 8 weeks. During the first 2 weeks, the ROM walker was locked at 30 degrees of plantarflexion, and in the third and fourth weeks, it was locked at 15 degrees plantarflexion. In the following weeks, range of motion in the ROM walker was allowed, with 30- to 15-degree range of motion in the fifth week and 30-0 degrees in the last 3 weeks. Protected weight bearing was allowed when the foot position reached neutral position for both surgical and non-surgical treatment. All patients were referred to physiotherapy for one instruction in home exercises upon removal of the orthosis.

2.2.2 New regimen – preferring functional rehabilitation as first choice treatment

In the new treatment regimen functional rehabilitation was preferred treatment. In this study, functional rehabilitation is defined as an organized treatment with early

mobilization for patients treated non-surgically. After November 2013, the primary treatment was changed to non-surgical treatment with functional rehabilitation. After diagnosis, the leg was placed in a walker boot with wedges for 8 weeks. For the first 2 weeks, the patients were immobilized with the foot in plantar flexion with three wedges and were non-weight bearing. One wedge was removed every second week starting from the second week. From the third week, weight bearing and range of motion exercises were allowed. Five times per day, the patient removed the walker boot and performed 25 repetitions of dorsi-plantarflexion and inversion-eversion with restricted dorsiflexion to neutral (0 degrees). In the sixth week, exercises with an elastic band (25 repetitions 5 times per day) were added. After 8 weeks, the walker boot was removed, and the patients attended 8 weeks of rehabilitation in group sessions led by a physiotherapist. Surgical treatment were indicated for Achilles avulsion from the calcaneus or open lacerations. Patients treated surgically after November 2013 followed the same rehabilitation program as patients treated with functional rehabilitation.

2.3 Outcome

The main outcome were patient-reported Achilles tendon Total Rupture Score (ATRS),[20] and the number of re-ruptures. The ATRS is determined based on 10 questions about pain and function. The score ranges from 0 to 100, where 100 equals no limitations. For objective measurements, Achilles tendon resting angle (ATRA), calf circumference, heel-rise height (HRH), and muscle endurance (ME) were used. ATRA measures the angle of the foot with the knee in 90-degree flexion. The foot will be relative more in dorsiflexion if the Achilles tendon is elongated. ATRA is used as a clinical measure for Achilles tendon length. It was performed as

described in the reliability study by Carmont et al.[21] Calf circumference was measured 15 cm distal from the anteromedial knee joint line.[21] HRH is the maximum height at one repetition single-leg heel rise on a 10-degree incline. ME was measured using MuscleLab (Ergotest Technology, Oslo, Norway).[22] MuscleLab has previously been used for monitoring patients with Achilles tendon ruptures.[7]

2.4 Four-year Follow-up

At the 4-year follow-up, patients were all welcomed by an orthopedic surgeon (ILK) for a consultation and information about the testing procedures. Another orthopedic surgeon (AK) examined all objective measures, and a physiotherapist (LN) guided all the patients to complete the ME test.

2.5 Statistics

Descriptive data is presented as mean with standard deviation, median with interquartile range or numbers and percentages as appropriate. Differences between groups in continues descriptive data were compared using an unpaired t-test (for ATRS also a Mann-Whitney test was performed). Categorical demographics were compared using a chi-squared test. Differences in objective measures between the affected side and the contralateral side was tested using paired t-tests. The Limb Symmetry Index (LSI) was used when comparing objective measures between groups and was calculated as follows: (Injured Side ÷ Non-injured side) × 100. Difference between groups in LSI was assessed using unpaired t-tests.

To assess the change in ATRS over time (1 year, 2 years, and 4 years after rupture), a mixed linear effect model was used with time and group as fixed effects and person (i.e. ID) as random effect. Due to the low number of re-ruptures, statistical

analyses for this outcome were not conducted. We used STATA, version 14.0 for all analyses.

2.6 Ethics

All patients received written and oral information before giving written consent. The Danish National Ethics Committee on Health Research was consulted, but approval was not necessary for this type of study.

3. Results

One hundred and ninety-two patients were invited to participate. Of them, 116 did not want to participate or did not show up at the follow-up as invited, 76 were included in the study. Details can be seen in Fig. 1. Characteristics of included patients are presented in Table 1. Patients who refused to participate or did not show up did not differ from included patients in age, sex, or type of treatment (Table 2).

Figure 1

Table 1

Table 2

At the 4-year follow-up, the mean ATRS for all patients was 71.4 (95% CI: 66.4 to 77.1). Patients following Previous regimen had mean ATRS of 69.1, 65.9, and 73.9 at 1-, 2-, and 4-year follow-ups (Fig. 2). For patients following New regimen, the mean scores were 61.5, 66.1, and 69.4 (Fig. 2). No difference was observed

between groups at any time. At 4 years follow-up the difference between treatment strategies were 4.5 points (95% CI: -6.8 to 15.8)(Table 1). Change in ATRS over time did not differ between groups (time x group interaction, p=0.8509) (Fig. 2). Number of re-ruptures did not differ between groups. The Previous regimen group had one re-rupture, and the New regimen group had two.

Figure 2

At the 4-year follow-up, there was a significant difference between the injured and non-injured side for all objective measures. The mean difference was 8.1 degrees (95% CI: 6.4 to 10.6) for ATRA, 2.9 cm (95% CI: 2.2 to 3.6) for HRH, and 1.6 cm (95% CI: 1.3 to 1.9) for calf circumference (Table 3). For ME, the mean differences were 2.7 cm (95% CI: 2.2 to 3.3) for average height, 5.0 (95% CI: 3.0 to 7.1) for number of repetitions, and 807 newtons (95% CI: 643 to 972) for the total work (Table 3). Regarding the objective measures and ME results for the Previous regimen and New regimen groups, there were no differences (Table 4).

Table 3

Table 4

4. Discussion

The results of the present study demonstrate that patients struggle to fully recover after an Achilles tendon rupture. For all objective measures, the injured side were impaired compared to the non-injured side 4 years after an acute Achilles tendon

rupture. No difference in any outcome was observed between patients treated according to the old regimen with surgery as first choice treatment compared with the new regimen with functional rehabilitation as first choice treatment.

The results of this study support the results from previous studies evaluating 2- and 7-year follow-ups and underline that regaining full function following an Achilles tendon rupture is difficult and only accomplished by few patients.[23,24] Previous studies comparing surgical and conservative treatment found no differences in ATRS for different treatment strategies but observed a difference in favor of surgical treatment in HRH and calf circumference.[15]

Previous research suggests that surgical treatment has a lower re-rupture rate than non-surgical treatment, although the risk difference is low (1.6%).[15] This small difference found in previous studies[15] indicates that clinical decision-making should not be based exclusively on re-rupture. Surgical treatment has a higher risk of other complications (3.3%), primarily due to a higher risk of infection. Functional outcome have been reported in several studies,[7,8,25] but to our knowledge, only two studies have measured ATRS more than 4 years after rupture.[24,26] In the present study, patients had a mean ATRS of 71 at the 4-year follow-up. This is about 20 points lower than the mean score reported by Brorsson et al.[24] at a 7-year follow-up. The exact reason for this difference is unknown but may reflect differences in patient populations. For example, Brorsson et al.[24] excluded patients older than 65 years and patients with diabetes, neurovascular diseases, and other diseases; such patients are likely to have poorer outcomes and were not excluded in the present study. Another reason for the difference could be that the potential for improvement

continues even after 4 years. Brorsson et al. found no difference in any outcomes between 2- and 7-year follow-ups, which indicates that improvement does not continue after 2 years.[24]

Similar to previous studies, we found no difference between treatment strategies preferring surgical treatment and functional rehabilitation, respectively, measured by ATRS, re-rupture rate, and objective measures at long-term follow-up (i.e., 4 years). The data in re-rupture rate in this study support previous reports on low re-rupture rates for both treatments[15]. This strengthens the existing evidence that the re-rupture rate is low for both treatments.[15]

As severe comorbidity was considered a contraindication to surgery not all patients underwent surgery in the period where surgery where surgery was the preferred treatment. Therefore, it is not possible to compare surgery vs. non-surgery, independent from regime, as it would result in significant bias. In the Previous regimen group, only 63% were treated surgically. The reason for not performing surgery despite this being the preferred strategy was mainly contraindications such as comorbidities or low functional status, but could also be due to increased attention to the topic in medical literature and at national and international conferences. Implementation of non-surgical treatment at several hospitals close by might also have made the surgeon more inclined to treat non-surgical instead of following the guidelines. In the local guideline for New regimen it was described that patients with open ruptures should be treated surgically. This might be the reason for 3 non-included patients treated surgical as presented in the drop-out analysis (table 2) . Comparing outcomes based on having surgery or not would introduce the risk of

confounding by indication. It is expected that the patients treated non-surgically in Previous regimen are patients with comorbidities or other factors due to which surgery would be a risk. Based on this, an analysis comparing treatments would presumably result in incorrect high functional mean scores for patients treated surgically.

There is a substantial number of studies examining whether patients should be treated surgically or non-surgically. As this study supports, patients do not fully recover at 4 years post injury. This raises the question of the importance of looking at other parts of the treatment. There might not be a treatment that fits all patients, and maybe the choice between surgery or non-surgery should be decided based on patient preferences or objective measures. New research is examining whether patients will have a better functional outcome if the choice between surgery or not is based on the gap between the tendon ends measured immediately after rupture.[27]

The functional deficits that patients experience in the lower leg affects the possibility of returning to previous sport.[19,28-30] Returning to physically demanding work is substantially delayed.[13] Professional athletes have to meet the high demands of returning to high-level sports, and they also struggle to return to play, but some do succeed.[29,30] Anticipating that consistent adherence to rehabilitation and ongoing training is part of the reason for athletes succeeding to return to highly demanding sports, it will be relevant in future research to investigate the contents and the potential of functional rehabilitation for both recreational and professional athletes.

Limitations

This study is a cohort study which have limitations compared to randomized controlled trials and the quality of data depend on the data available from the database.

The participation rate for the study was relatively low (40%), which could affect study generalizability. The invitation was sent through a secure online mailing system, which might have resulted in some patients not seeing the invitation. For ethical reasons, it was not possible to call the patients who did not respond to the written invitation.

Low participation rate could result in attrition bias. To examine if included patients differed from those who did not show up at the 4-year follow-up, a dropout analysis was performed. We found no difference between the included and non-included patients in terms of age, sex, or previous ATRS (i.e., 1 year) (Table 2) suggesting that we did not have a systematic loss to follow-up. For this study only data from the DADB was available. As we only have data if the patients attended the follow up at different timepoints, the missing data for ATRS at one and two years follow-up is relative high. We could not provide information on re-ruptures from patients not participating, as additional review of patient records require consent from the patients. For data collected from a database, the quality of data is dependent on the database, and due to changes in objective measures over time, comparing objective measures over time was not possible. The treatment regimen differed in both time of immobilization, type of cast and number of appointments with physiotherapist as the two regimens where different, not only on whether they had surgery or not. As data from time of rupture is from the database, we neither have information about specific treatments for each patient or whether they supplemented the rehabilitation with

other treatments. Collecting this information at 4 years follow-up will have a high risk of recall bias.

The difference between treatment strategies in ATRS score was 4.5 points (CI: -6.8 to 15.8). It is lower than the 7 points which is usually considered to the minimal clinical important difference for the ATRS score[31]. As 95% CI expands over the 7 points we can not refute that there could potentially be a clinically important difference between groups.

Perspective

This study contributes to previous findings that there is no difference between treatment strategies for acute Achilles tendon ruptures. In future studies, it would be relevant to add an economic analysis to expand the parameters based on which treatment decisions are made. This analysis should include the cost of surgery and rehabilitation.

5. Conclusions

In conclusion, we found that patients at an average age of 53 years still had patient reported impairments and objective functional deficits 4 years after an acute Achilles tendon rupture compared with their uninjured side. No differences in patient reported outcome or objective measures at the 4 years follow-up were observed between two consecutive cohorts with either a regimen with surgery as the preferred treatment option compared with a regimen where functional rehabilitation (non-surgical treatment) was the preferred strategy.

Brief Summary

What is already known

- Acute Achilles tendon rupture is a common injury and the incidence has increased the last decades.
- Optimal treatment for acute Achilles tendon rupture is still uncertain.
- Patients have functional deficits 1-2 years after acute Achilles tendon rupture, but long-term follow-up studies are scarce .

What this study adds

- Functional deficits persists 4 years after Achilles tendon rupture.
- Difference between injured and non-injured side in objective measures is observed 4 years after an Acute Achilles tendon rupture.
- No improvements in functional outcomes was observed between 2 and 4 years after an Acute Achilles tendon rupture.

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Tables

Table 1

Table 1 Patient characteristics at the 4-year follow-up (n=76)

	All patients (n=76)	Previous regimen (n=35)	New regimen (n=41)	Difference	P-value
Age (years)	53.7 ± 12.5 (25.8-81.3)	53.7 ± 12.6 (25.7-81.3)	53.7 ± 12.6 (27.4-76.7)	0.0	0.994
Height (cm)	177 ± 7 (154-196)	178 ± 8 (160-196)	177 ± 7 (154-192)	1.4	0.387
Weight (kg)	82 ± 14 (52-134)	82 ± 14 (52-110)	83 ± 14 (63-134)	-0.6	0.859
BMI (kg/m^2)	26.2 ± 4.3 (18.7-45.8)	25.8 ± 3.7 (18.7-32.8)	26.5 ± 4.8 (21.4-45.8)	-0.8	0.435

Sex					
Female	22 (29%)	8 (23%)	14 (34%)	-11%	0.279
Male	54 (71%)	27 (77%)	27 (66%)		
Time since rupture (years)	4.3 ± 0.8 (3.0-5.9)	5.0 ± 0.5 (4.3-5.9)	3.7 ± 0.4 (3.1-4.2)	1.4	<0.001
Treatment					
Surgical	22 (29%)	22 (63%)	0 (0%)	63%	<0.001
Non-surgical	54 (71%)	13 (37%)	41 (100%)		
Injured side					
Right	31 (41%)	16 (46%)	15 (37%)	9%	0.420
Left	45 (59%)	19 (54%)	26 (63%)		
Dominant side					
Yes	31 (50%)	11 (52%)	20 (49%)	3%	0.788
No	31 (50%)[b]	10 (48%)[c]	21 (51%)		
Pre-ATRS score[a]					
Mean	95 ± 13[d]	98 ± 4[e]	93 ± 17	5.2	0.081
Median	100 (25-100)	100 (84-100)	100 (25-100)	0	0.359
4 years ATRS score					
Mean	71.4 ± 27	73.9 ± 22	69.4 ± 27	4.5	0.432
Median	79.5 (9-100)	79 (20-100)	80 (9-100)	0.5	0.628

Continuous variables are presented with mean, standard deviation and min-max values.

ATRS are presented with with mean, standard deviation and median and min-max values

Dichotomous variables are presented as numbers and percentage.

[a]The pre-ATRS score was assessed at inclusion and not at 4 years follow-up. [b]n=62, [c]n=21, [d]n=75, [e]n=34.

1

Table 2

Table 2 Treatment, ATRS-scores at 1 and 2 years follow-up and health data for included and non-included patients (n=192)

	Included (n=76)	Non-included (n=116)	P-value
Surgical vs. non-surgical			
Treatment Previous regimen			
Surgical	22(63%)	27 (44%)	0.068
Non-surgical	13 (37%)	36 (56%)	
Treatment New regimen			
Surgical	0 (0%)	3 (6%)	0.122
Non-surgical	41 (100%)	50 (94%)	
ATRS and health data			
Age	53.7 ± 12.5[a] (25.8-81.3)	50.9 ± 13.5[b] (26.3-87.3)	0.149
Sex			
Female	22 (29%)	23 (21%)	0.234
Male	54 (71%)	85 (79%)	
Pre-ATRS			
Mean	95 ± 13[c]	92 ± 17[d]	0.197
Median	100 (25-100)	100 (25-100)	0.693
ATRS at 1-year follow-up			
Mean	65 ± 23[e]	58 ± 27[f]	0.125
Median	78.5 (12-100)	64 (5-99)	0.159
ATRS at 2-year follow-up			
Mean	66 ± 25[g]	68 ± 27[h]	0.681
Median	67 (8-100)	70.5 (2-100)	0.498
Diabetes			0.389
Yes	2 (3%)	6 (5%)	

No	74 (97%)	110 (95%)	
Smoker			
Yes	9 (12%)	26 (22%)	0.064
No	67 (88%)	90 (78%)	

Continuous variables are presented with mean, standard deviation and min-max values.

ATRS are presented with with mean, standard deviation, median and min-max values

[a]n=76, [b]n=116, [c]n=75, [d]n=110, [e]n=63, [f]n=73, [g]n=59, [h]n=60.

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Table 3

Table 3 Objective measures at the 4-year follow-up (n=76)

	Injured side (n=76)	Non-injured side (n=76)	Difference	P-value
ATRA (degrees)	54.9 (53.2 to 56.5)	46.7 (45.0 to 48.4)	-8.1[r] (6.4 to 9.8)	<0.001
Heel-rise height (cm)	8.8 (7.8 to 9.7)	11.6 (10.9 to 12.4)	2.9 (2.2 to 3.6)	<0.001
Calf circumference (cm)	36.1 (35.3 to 36.9)	37.7 (36.9 to 38.5)	1.6 (1.3 to 1.9)	<0.001
Muscle endurance				
Avg. height (cm)	7.9 (7.1 to 8.7)	10.7 (10.1 to 11.3)	2.8 (2.2 to 3.3)	<0.001
Repetitions (n)	21.5 (18.6 to 24.5)	26.5 (23.6 to 29.4)	5.0 (3.0 to 7.1)	<0.001
Total work (joule)	1412 (1202 to 1623)	2219 (1996 to 2443)	807 (643 to 972)	<0.001

Values are reported as mean with 95% confidence intervals.

Difference is reported as mean difference between injured and non-injured side with 95% confidence intervals.

[r]Difference do not correspond with difference in injured side and non-injured side because of rounding.

Table 4

Table 4 Difference in objective measures between groups at 4 years follow-up (Limb Symmetry Index) (n=76)

	Previous regimen (n=35)	New regimen (n=41)	Difference	P-value
ATRA (degrees)	117.7% (111.4 to 124.0)	120.6% (115.0 to 126.3)	-2.9% (-11.2 to 5.4)	0.488
Heel-rise height (cm)	78.9% (69.8 to 88.1)	69.3% (59.8 to 78.8)	9.7%[r] (-3.4 to 22.8)	0.146
Calf circumference (cm)	96.0% (94.9 to 97.1)	95.6% (94.4 to 96.7)	0.5%[r] (-1.1 to 2.0)	0.555
Muscle endurance				
Avg. height (cm)	76.7% (68.8 to 84.6)	69.2% (60.2 to 78.1)	7.5% (-4.4 to 19.5)	0.219
Repetitions (n)	87.1% (74.8 to 99.3)	72.2% (61.8 to 82.6)	14.8%[r] (-0.8 to 30.5)	0.063
Total work (joule)	69.4% (56.8 to 82.1)	54.9% (45.3 to 64.5)	14.5% (-0.9 to 29.9)	0.064

Values are reported as percentage difference between injured and non-injured side (Limb Symmetry Index) with 95% confidence intervals.

Values above 100 indicate highest mean score for injured side and values below 100 indicate highest score for non-injured side.

[r]Difference do not correspond with difference in Previous regimen and New regimen values because of rounding.

Figures

Figure 1

Figure 1 Flow-chart of recruiting (n=222)

Figure 2

Figure 2 Mean ATRS-scores wit 95% confidence intervals at different time points.(n=76)

Legend: Mean scores with 95% confidence intervals. Time x group interaction, p=0.8509