Eccentric and Isometric Exercises in Achilles Tendinopathy Evaluated by the VISA-A Score and Shear Wave Elastography

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Background: Apart from eccentric exercises (EE), isometric exercises (ISO) might be a treatment option for Achilles tendinopathy. Shear wave elastography (SWE) provides information for diagnosis and for monitoring tissue elasticity, which is altered in symptomatic tendons.

Hypothesis: Isometric exercises will have a beneficial effect on patients' outcome scores. Based on SWE, insertional and midportion tendon parts will differ in their elastic properties according to current symptoms.

Study Design: Randomized clinical trial.

Level of Evidence: Level 2.

Methods: Group 1 (EE; n = 20; 12 males, 8 females; mean age, 52 ± 8.98 years) and group 2 (EE + ISO; n = 22; 15 males, 7 females; mean age, 47 ± 15.11 years) performed exercises for 3 months. Measurement points were before exercises were initiated as well as after 1 and 3 months using the Victorian Institute of Sports Assessment–Achilles (VISA-A) score, American Orthopaedic Foot & Ankle Society score, and SWE (insertion and midportion).

Results: Both groups improved significantly, but there were no significant interindividual differences (VISA-A; $P = 0.362$) between group 1 (n = 15; +15 VISA-A) and group 2 (n = 15; +15 VISA-A). The symptomatic insertion (symptomatic, 136.89 kPa; asymptomatic, 174.68 kPa; $P = 0.045$) and the symptomatic midportion of the Achilles tendon (symptomatic, 184.40 kPa; asymptomatic, 215.41 kPa; $P = 0.039$) had significantly lower Young modulus compared with the asymptomatic tendons. The midportion location had significantly higher Young modulus than the insertional part of the tendon ($P = 0.005$).

Conclusion: Isometric exercises do not have additional benefit when combined with eccentric exercises, as assessed over a 3-month intervention period. SWE is able to distinguish between insertional and midportion tendon parts in a symptomatic and asymptomatic state.

Clinical Relevance: The present study shows no additional effect of ISO when added to baseline EE in treating Achilles tendinopathy. Different elastic properties of the insertional and midportion tendon have to be taken into consideration when rating a tendon as pathologic.

Keywords: Achilles tendinopathy; shear wave elastography; tendon; muscle; eccentric exercises; isometric exercises

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The current gold standard for the treatment of Achilles tendinopathies (AT) is eccentric exercises (EE).²⁷ However, some patients are not able to perform EE for the entire therapy duration due to pain related to the exercises.¹⁷ Therefore, Rio et al¹⁷ introduced isometric exercises (ISOs) as an additional therapeutic option to treat tendinopathies. Isometrics are thought to have a central nervous neuroplastic effect, reducing the inhibition of corticospinal pathways. ISOs are based on the assumption that painful movement changes motor control and leads to aberrant motor patterns with increasing inhibition of neural motor pathways, which might be a contributing factor for recalcitrant tendinopathy due to disadvantageous motor patterns.¹⁷ As ISOs should be conducted pain-free, with reduced intensity if pain occurs, they might reset pathologic change of motor patterns. Clinical studies on patellar tendinopathy showed good results with ISOs, with reduced pain intensity after 4 weeks without a mandatory reduction of load.^{18,19} So far, effects of isometric training have not been studied in AT.

Recently, ultrasound-based shear wave elastography (SWE) has been used to measure tissue elasticity in tendons and might add to a better understanding about the effects of EE in tendons.²³ Additionally, SWE is able to measure the Young modulus of tendons with high reliability (Achilles tendon: interobserver, 0.940; intraobserver, 0.916).^{12,22} Previous studies suggest that SWE might be a useful tool for diagnosing and monitoring AT.^{5,7} Dirrichs et al⁶ demonstrated that symptomatic Achilles tendons have decreased Young modulus compared with healthy ones and that stiffness increases in correlation with the Victorian Institute of Sports Assessment–Achilles (VISA-A) score after 6 months. However, little is known about monitoring AT in the short term after 1 or 3 months. Additionally, in these studies, SWE values were related to the entire Achilles tendon, and there was no subdivision into midportion or insertional tendon SWE values. As insertional and midportion AT can have different etiologies, it is crucial to obtain further information about SWE values of the tendon sublocations, especially changes under EE and ISO.

The first aim of this prospective randomized clinical study was to comparatively analyze the short-term effects of EE versus EE + ISO in AT. The second aim was to determine SWE values in tendon sublocations (insertion and midportion) in correlation with the VISA-A score in a short-term period of 3 months.

METHODS

This is a prospective randomized clinical trial comparing 2 intervention groups: symptomatic AT treated with EE (group 1) and symptomatic AT treated with EE + ISO (group 2). The investigation was approved by the clinical ethics committee of the local medical faculty (EK 059/17), and all participants provided written informed consent. The CONSORT (Consolidated Standards of Reporting Trials) checklist was used to improve the scientific validity of the study.²¹

Inclusion and Exclusion Criteria

Participants were recruited from pharmacies or doctor's offices from July 2017 through March 2018. AT had been already diagnosed and was treated unsuccessfully (secondary health care). AT was confirmed by case history (eg, morning stiffness, pain after loading, walking downstairs) and a careful physical examination with provoked pain by palpation. Hutchison et al⁸ reported that pain on palpation of the tendon (sensitivity, 84%; specificity, 73%) and subjective reporting of pain 2 to 6 cm above the insertion (sensitivity, 78%; specificity, 77%) have acceptable diagnostic accuracy. Pathological ultrasound findings were not required for study inclusion; however, a partial rupture viewed on the initial ultrasound examination would lead to exclusion from the trial.

Inclusion criteria were insertional or midportion AT, age ≥ 18 years, minimum symptom duration of 2 months, and the physical ability to perform the physiotherapeutic exercises carefully evaluated by an experienced physician. Patients were excluded from the study if they were pregnant, were overweight (body mass index >35 kg/m²) or underweight (body mass index <17 kg/m²), had a previous rupture or an operation in the area of symptoms, or had injections within the previous 6 months.

Study Design

Figure 1 gives an overview of the study design. In total, we evaluated the patients 3 times: before exercises and after 1 and 3 months. At every time point, participants' symptoms were evaluated by clinical scores and by ultrasound and SWE examinations of both Achilles tendons and calf muscles. Four different scores/scales have been used to describe the current status and the development of symptoms in AT: the VISA-A score,¹³ American Orthopaedic Foot & Ankle Society (AOFAS) score,¹¹ Likert scale,²⁰ and the Roles and Maudsley scale.¹⁶ Primary outcome measure was the VISA-A score, which is especially designed for AT (0, maximum pain; 100, no pain). Relevant improvement or worsening was determined by a minimum change of ± 10 points on the VISA-A score, and VISA-A scores over 90 were considered as an excellent outcome.⁹

Before the first appointment participants were randomly assigned to either group 1 or group 2 by sealed, numbered envelopes. Patients and examiners were not blinded to the result of the randomization. Sample size was calculated based on an α error of 0.05 and a β error of 0.2, assuming that the VISA-A score of group 1, receiving the standard treatment, would rise 10 (SD ± 8) points and that that of group 2, receiving additional isometric exercises, would rise at least 19 points. Minimum sample sizes for both groups were 15 (power, 0.82).

Intervention: EE Versus ISO

All exercises were performed as home-based exercises. All exercises were demonstrated at baseline and participants received a brochure with images and further explanations. At every further appointment, performance of the exercises was

Figure 1. Flowchart of the study design. AOFAS, American Orthopaedic Foot & Ankle Society; B-US, B-mode ultrasound; EE, eccentric exercises; ISO, isometric exercises; PD-US, PowerDoppler ultrasound; SWE, Shear wave elastography; VISA-A, Victorian Institute of Sports Assessment–Achilles.

Figure 2. Isometric exercises: At load level 1 (a), patients were standing 45 seconds on the tip of toes of both legs, whereas at load level 2 (b), they were standing with all their body weight just on the symptomatic leg. At level 3 (c), individuals should add further load by pushing themselves down while standing under a door frame.

checked, and participants were asked how many times per day they performed the EE and ISOs.

Group 1 performed EE twice per day, with 3 sets of 15 repetitions on a step for 3 months. Participants started by standing on tiptoe on the affected leg while lowering the heel with an extended knee slowly under the level of the step and holding this position for 2 seconds.¹ Then all the weight was loaded on the other leg so that the patient got back into the initial position without performing concentric calf muscle contractions of the symptomatic foot. Patients with insertional AT were instructed to not lower the heel under the level of the step to prevent impingement of the calcaneus and the insertional Achilles tendon.¹⁰ Participants were informed that exercises might be painful and that initial symptoms might increase.

Group 2 performed EE the same way as group 1. Additionally, they performed ISOs once per day, with 5 sets of 45 seconds each. There were 3 levels of loads that built on one another. Patients were briefed to do the exercises cautiously and pain-free, going to the next level if they were not feeling pain or exhaustion at maximum load. At load level 1, patients were standing 45 seconds on the tip of toes of both legs, whereas at load level 2 they were standing with all their body weight just on the symptomatic leg. At level 3, individuals further increased the load by pushing themselves down while standing under a door frame (Figure 2). Patients were advised to choose the amount of plantarflexion themselves, depending on how they felt the maximum load.

Data Acquisition With B-US, PD-US, and SWE

Every participant underwent a standardized multimodal ultrasound protocol consisting of B-mode (B-US),

PowerDoppler (PD-US), and SWE of the left and right Achilles tendons. Examinations were conducted using an ultrasound system (Aixplorer; Supersonic Imagine) with a high-resolution linear 18-MHz transducer (SuperLinear SL 18-4; Supersonic Imagine) in longitudinal and transverse planes.

For the Achilles tendon examination, patients were asked to lie in a prone position with the foot hanging relaxed over the examination couch. A gel cushion delay block (Sonogel; Sonokit Proxon; length, 100 × 100 mm; delay distance, 10 mm) was used to improve docking. Achilles tendon thickness was measured in the longitudinal plane at the thickest point to ensure that the plane was strictly orthogonal through the oval tendon.⁵ PD-US was conducted in the transverse and longitudinal planes of the entire tendon. Neovascularization was rated according to the Öhberg score (0, no vessels; 1, one or two vessels anterior of the tendon; 2-4, two, three, four, or more vessels inside the tendon).¹⁵ PD-US assessment is a valid and reliable method to evaluate tendon vascularization (interobserver, 0.86; intraobserver, 0.95).²⁴

The acquired SWE information was evaluated quantitatively in kilopascals (kPa) up to a maximum tissue rigidity of 300 kPa (10 m/s). The standard size of the SWE measurement window was 1 cm², with a region of interest of 3 mm in the most rigid part of the measurement window. Tendon stiffness was rated separately according to insertion (0-2 cm of the calcaneus) and midportion (2-6 cm), with 3 measurements for each location for a total of 6 images per tendon. Mean values and standard deviations were calculated separately for the insertion and the midportion. Primary outcome measures were the mean SWE values in the longitudinal planes of the tendon insertion and midportion.

Table 1. Patient characteristics for the EE group and EE + ISO group

	EE Group (n = 20)	EE + ISO Group (n = 22)	<i>t</i> Test
Right insertion	7	2	
Left insertion	7	3	
Right midportion	10	12	
Left midportion	6	15	
Male	12	15	
Female	8	7	
Age, y, mean (range; SD)	52 (30-52; 8.98)	47 (21-73; 15.11)	<i>P</i> = 0.177
Body mass index, kg/m ² , mean (range; SD)	25 (19-34; 5.3)	25 (20-32; 3.25)	
Weight, kg, mean (range; SD)	77 (54-120; 14.71)	79 (57-116; 14.00)	<i>P</i> = 0.578
Height, cm, mean (range; SD)	175 (162-193; 10.15)	178 (160-190; 8.91)	<i>P</i> = 0.492
Symptom duration, mo, mean (range; SD); median	32 (2-100; 28.15); 24	23 (3-72; 19.40); 18	<i>P</i> = 0.251
Initial VISA-A score, mean (range; SD)	70.75 (50-80; 8.66)	66.18 (40-88; 12.68)	<i>P</i> = 0.185
Sport, h/wk, mean (range; SD)	3 (0-6; 1.90)	4 (0-12; 3.59)	<i>P</i> = 0.300
Previous treatments, n, mean (range; SD)	3 (1-5; 0.7)	3 (1-5; 0.9)	<i>P</i> = 0.768
Medication	16	16	
Cryotherapy	9	11	
Physical therapy (friction, stretching)	13	15	
Orthopaedic aids (bandages, insoles)	10	6	
Others (shockwave, acupuncture)	3	2	

EE, eccentric exercises; ISO, isometric exercises; VISA-A, Victorian Institute of Sports Assessment–Achilles.

Statistical Analysis

For all analyses, SPSS 22.0 (IBM Corp) was used to assess statistical significance, which was defined as $P < 0.05$. Normally distributed data were evaluated with the Kolmogorov-Smirnov test and chi-square test. One-way analysis of variance (ANOVA) with repeated measures (Greenhouse-Geisser) was used to examine significant changes over time for VISA-A and AOFAS scores. Since the Roles and Maudesly score has an ordinal scale, the Friedman test was used. Post hoc tests used the Bonferroni correction. Paired and unpaired *t* tests examined significant differences of SWE values within and between groups. Spearman correlation coefficient analyses assessed correlation between the VISA-A and the sonographic parameters as B-US, Öhberg score, and SWE values of the tendon. We compared the differences between the first and the last score after 3 months with the difference in the sonographic parameters during this time.

RESULTS

Table 1 shows the characteristics of the participants of each group. The flowchart depicts the exact group sizes during the study period (Figure 1). Unfortunately, 25% of the initial cohort in the EE group and 32% in the EE + ISO group were lost to follow-up. Nevertheless, the minimum sample size was still achieved after 3 months. In the first month, all patients were performing EE twice and ISOs once per day, while afterward, compliance decreased in both groups equally and EEs were performed only once per day on average. There were no reported side effects from the physiotherapeutic intervention in the final cohort. In total, 4 patients discontinued participation due to pain.

Primary Outcome (VISA-A)

The boxplots in Figure 3 depict VISA-A improvement separately for both groups. Repeated-measures ANOVA demonstrated a significant improvement during treatment for the EE

Figure 3. Box plots illustrating increase of VISA-A score. EE group: VISA-A score initial mean = 70.75 (50-80; SD, 8.66; $n = 20$); VISA-A score after 1 month mean = 76.55 (58-100; SD, 11.24; $n = 16$), VISA-A score after 3 months mean = 85.26 (75-100; SD, 9.13; $n = 15$). EE + ISO group: VISA-A score initial mean = 66.18 (40-88; SD, 12.68; $n = 22$); VISA-A score after 1 month mean = 71.55 (22-100; SD, 18.48; $n = 18$), VISA-A score after 3 months mean = 81.40 (49-100; SD, 15.38; $n = 15$). EE, eccentric exercises; ISO, isometric exercises; VISA-A, Victorian Institute of Sports Assessment-Achilles.

($F(2, 28) = 26.711$; $P = 0.000$; partial $\eta^2 = 0.656$; $n = 15$); and EE + ISO ($F(2, 28) = 11.544$; $P = 0.000$; partial $\eta^2 = 0.452$; $n = 15$) groups. Post hoc tests using the Bonferroni correction revealed significant changes between all measured time points in the EE group (baseline vs 1 month, $P = 0.019$; baseline vs 3 months, $P = 0.000$; 1 vs 3 months, $P = 0.002$). In contrast, for the EE + ISO group, the only significant change was found between baseline and 3 months ($P = 0.001$). Absolute score improvement during the 3 months (+14.5 / +15.2) was similar in both groups

and confirmed with ANOVA ($F(2, 56) = 0.362$; $P = 0.362$; partial $\eta^2 = 0.13$; $n = 15$). In summary, study participants in both groups improved significantly, but there was no treatment effect of additional ISO found for the VISA-A score.

Secondary Outcome (AOFAS, Likert, Roles and Maudsley)

Figure 4 shows changes in the Roles and Maudsley score and the Likert scale.

In the EE group, the AOFAS score increased from a mean of 80 (range, 72-90; SD, 6.29; $n = 20$) to a mean of 83 after 1 month (range, 75-100; SD, 6.64; $n = 16$), reaching a final mean score of 87 after 3 months (range, 70-100; SD, 9.19; $n = 15$). ANOVA revealed a significant improvement in AOFAS scores ($F(2, 28) = 6.167$; $P = 0.006$; partial $\eta^2 = 0.306$; $n = 15$), between baseline and 3 months ($P = 0.019$). In the EE + ISO group, the AOFAS score increased from a mean of 80 (range, 68-93; SD, 6.93; $n = 22$) to a mean of 83 after 1 month (range, 48-100; SD, 11.50; $n = 18$), reaching a final mean score of 86 after 3 months (range, 71-100; SD, 9.29; $n = 15$). ANOVA with a Greenhouse-Geisser correction revealed no significant improvement in the AOFAS score over time ($F(1.42, 19.81) = 2.564$; $P = 0.155$; partial $\eta^2 = 0.155$; $n = 15$). There was no significant difference in the AOFAS score between groups.

B-US and PD-US Findings in Tendons

In a pooled analyses of all tendons in both groups ($n = 84$, 40 in group 1 and 44 in group 2), symptomatic tendons were significantly thicker (mean, 0.75 cm, SD, 0.24; $n = 57$) than asymptomatic tendons (mean, 0.60; SD, 0.24; $n = 27$) ($t(77) = -2.946$; $P = 0.004$). Symptoms improved due to therapy, but tendons did not show any significant reduction in thickness during 3 months: ANOVA ($F(2, 84) = 0.834$; $P = 0.438$; $n = 42$). Hypoechoic areas were noticeable in 41 of 57 symptomatic tendons and in 11 of 27 asymptomatic tendons. The Friedman test revealed no significant changes in the hypoechoic areas during 3 months of therapy, ($\chi^2(2) = 0.182$; $P = 0.913$; $n = 42$). Calcification was visible in 8 of 57 symptomatic tendons and 1 of 27 asymptomatic tendons. PD-US depicted neovascularization in 29 of 57 symptomatic tendons (Öhberg 0, 28/57; Öhberg I, 4/57; Öhberg II, 6/57; Öhberg III, 2/57; Öhberg IV, 17/57) and in 6 of 27 asymptomatic tendons. Based on these data, a Friedman test showed no significant changes in the Öhberg score over 3 months ($\chi^2(2) = 2.179$; $P = 0.336$; $n = 42$).

SWE Values in Relation to Insertional Versus Midportion Location

In pooled analyses of all tendons in both groups, insertion area measurements were, on average, lower in symptomatic tendons (mean, 136.89 kPa; SD, 60.71; $n = 19$) than in asymptomatic ones (mean, 174.68 kPa; SD, 73.68; $n = 65$), with a significant difference, ($t(82) = -2.040$; $P = 0.045$). This was also noted in the midportion: Symptomatic Achilles tendons had lower Young modulus (mean, 184.40 kPa; SD, 69.81; $n = 43$) than asymptomatic ones (mean, 215.41 kPa; SD, 65.68; $n = 41$) ($t(82) = -2.095$; $P = 0.039$). In general, the symptomatic and asymptomatic midportion location had a significantly higher Young modulus

Figure 4. The Likert scales of both groups showed that over 60% of the final cohort rated their actual status as “much improved” or “completely recovered.” In the Roles and Maudsley score, 60% in the EE group and 50% in the EE + ISO group estimated their actual function as “good” or “excellent.” EE, eccentric exercises; ISO, isometric exercises.

than the symptomatic ($t(60) = 2.487$; $P = 0.016$) and asymptomatic ($t(64) = 2.88$; $P = 0.005$) insertional part of the tendon.

Monitoring and Score Correlation of SWE Values in Tendons

During therapy, elastic properties of tendons significantly increased for the EE group (164.63, 184.13, and 201.59 kPa at baseline, 1 month, and 3 months, respectively) ($F(10252, 1351) = 7.584$; $P = 0.001$; $n = 15$). For the EE + ISO group, SWE values increased after 1 month but then stayed at that level (164.41, 185.47, and 185.20 kPa at baseline, 1 month, and 3 months, respectively). Therefore, in the EE + ISO group, the increase in SWE values was not significant ($F(2189, 1240) = 1.765$; $P = 0.190$; $n = 15$). There was no correlation between the initial VISA-A score (mean, 68; SD, 11; $n = 42$) and the initial SWE values (mean, 177.28 kPa; SD, 68.41; $n = 42$) measured at the insertion and/or midportion, where pain was clinically located ($r = 0.118$; $P = 0.455$; $n = 42$). Based on our findings, there was also no correlation between absolute VISA-A score increase and

alteration of SWE values at the area of located pain or the different measure points (baseline vs 1 month, $r = -0.20$; $P = 0.914$; $n = 34$; baseline vs 3 months, $r = 0.129$; $P = 0.495$; $n = 30$).

DISCUSSION

This randomized controlled trial study compared the outcome of EE versus EE + ISO in AT, showing that EE and EE + ISO improve symptoms (VISA-A, +15), but ISOs do not have an additional therapeutic effect compared with EE alone during the short-term follow-up period of 3 months. The second result of our study was that, in general, Achilles tendons have poorer elastic properties at the insertion than at the midportion, which has to be taken into consideration when rating tendons as pathologic.

Outcome EE Versus EE + ISO

Recently, Rio et al^{17,19} reported immediate pain relief and pain reduction after isometric training using a simple portable belt for isometric squat exercises in patients with patellar tendinopathy.

ISOs are based on the assumption that painful movement changes motor control and leads to aberrant motor patterns with increasing inhibition of neural motor pathways, which might be a contributing factor for recalcitrant tendinopathy due to disadvantageous motor patterns.¹⁷ Rio et al¹⁷ found that pain relief was associated with a release of intracortical inhibition of the motor unit. It is already known that ISOs achieve a higher activation level of motor units than eccentric or concentric exercises,³ and as ISOs were performed pain-free, there might be no physiological reason to inhibit muscle activity. Consequently, aberrant motor patterns might be reset. However, this randomized controlled trial study revealed that during the first 3 months of training, there were no further positive pain-releasing effects with additional ISOs in a physiotherapeutic program based on EE, as both groups improved nearly equally. Because of the study design, it remains unclear whether ISOs without combined EE would achieve a better outcome. Even though ISOs were performed pain-free, painful EE might have equalized the potential effect of ISOs' stimulating the corticospinal pathways, as they were performed nearly immediately before ISOs. In previous studies investigating ISOs for tendinopathy, no control group has been included. Therefore, comparison of the outcome with EE alone was not possible. Moreover, because of the lack of previous ISO protocols, it is not clear whether the patients' outcome would have benefited from greater load or other modifications of our protocol. Nevertheless, in a cohort study, 16 individuals suffering from AT performed 45-second isometric contractions without any immediate benefits of sensory or motor output compared with pretesting.¹⁴ To sum up, this preliminary study could not find any further benefit of a combination of EE and ISO for AT in the first 3 months of training.

SWE Values in Tendons

Our study revealed that symptomatic Achilles tendons in the insertion or midportion have in general significantly lower Young modulus than asymptomatic ones. Pathophysiologically, this might be due to higher concentrated proteoglycans in symptomatic tendons, such as aggrecan and versican, which bind water molecules more strongly than physiological proteoglycans.^{2,26} During the 3 months of physiotherapeutic treatment, symptoms decreased in our study and tendons developed higher elastic properties, which possibly can be explained by a reduction of

these pathological highly concentrated proteoglycans. In a study by Dirrichs et al⁶ evaluating a 6-month period, increase in SWE values was significant, whereas in the current study evaluating short-term results (3 months), there was only a significant increase in SWE values for the EE alone group 1. It might be that a longer follow-up period would be more appropriate, since VISA-A score changes also did not correlate with SWE values, as reported by Dirrichs et al.⁶

Further aspects of this study reveal that the midportion area has higher elastic values than the insertional part of the tendon. In ultrasound tissue characterization, a specific ultrasound for characterizing tendon integrity due to echo patterns in 4 grades with semihistological information, normal Achilles tendon insertion reveals significantly more grade II fibers (swollen fibers) than normal midportion, which could explain our results.²⁵

Limitations

Putting the focus on a short-term period of 3 months, this study does not give further information about the therapeutic benefits of EE + ISO in the long term and has to be interpreted as a preliminary study. Because of the study design, no conclusions can be made for ISO alone, since a third group would have been necessary. Moreover, differences in the clinical outcome concerning insertional and midportion tendinopathy could not be analyzed separately due to a limited cohort size. A further limitation of this study is that the patients did not receive feedback by a metronome, as described in previous studies, while conducting ISOs,^{18,19} which might have influenced the outcome. Moreover, general outcome of the individuals might have been influenced positively by absence of hypoechogenicity in some individuals of our study, as focal changes in echogenicity might be associated with a worse outcome potential.⁴

CONCLUSION

No additional clinical benefits of adding ISOs to a basic EE program could be found in this preliminary randomized controlled trial study over a period of 3 months. SWE was able to differentiate between insertional and midportion tendon tissue and localize reported symptoms to sublocations. Still, SWE did not correlate with clinical scores (VISA-A) over a 3-month follow-up period.

Clinical Recommendations

SORT: Strength of Recommendation Taxonomy

A: consistent, good-quality patient-oriented evidence

B: inconsistent or limited-quality patient-oriented evidence

C: consensus, disease-oriented evidence, usual practice, expert opinion, or case series

Clinical Recommendation	SORT Evidence Rating
Isometric exercises were found in some cohort studies to have a benefit in the treatment of tendinopathies, but the present randomized controlled trial study could not confirm this effect in 3 months of eccentric + isometric exercises for Achilles tendinopathy	B

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