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SYSTEMATIC REVIEW

THE VICTORIAN INSTITUTE OF SPORTS ASSESSMENT – ACHILLES QUESTIONNAIRE (VISA-A) – A RELIABLE TOOL FOR MEASURING ACHILLES TENDINOPATHY

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ABSTRACT

Background: Achilles tendinopathy (AT) is a common pathology and the aetiology is unknown. For valid and reliable assessment The Victorian Institute of Sports Assessment has designed a self-administered Achilles questionnaire, the VISA-A. The aim of the present study was to evaluate VISA-A as an outcome measure in patients with AT.

Methods: A systematic search of the literature was conducted using MEDLINE, EMBASE, CINAHL, PEDro, Web of Science, and Cochrane Controlled trials to identify trials using VISA-A for patients with AT. This was followed by data mining and analysis of the obtained data.

Results: Twenty-six clinical trials containing 1336 individuals were included. Overall mean VISA-A scores ranged from 24 (severe AT) to 100 (healthy). Mean VISA-A scores in patients with AT ranged from 24 to 96.6. Healthy subjects scored a minimum of 96. Only two groups of participants from two different studies had a post-VISA-A score as high as healthy individuals, indicating full recovery of the AT.

Conclusions: A VISA-A score lower than 24 is rarely attained in AT. Only few patients with AT reach an equivalent VISA-A score compared to uninjured healthy subjects following treatment. The VISA-A is a reliable tool when assessing AT patients, providing a good assessment of the actual condition from very poor, (score around 24) to excellent (a score of 90), which based on this systematic review and previous studies could be considered full recovery from AT.

Key Words: Achilles tendinopathy, outcome measure, reliability, VISA-A.

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BACKGROUND

Achilles tendinopathy (AT) is a common overuse injury, especially among athletes, but also in non-athletes.[1] AT often becomes chronic. The incidence of AT has been rising over the past three decades[1] and the aetiology is considered to be multi-factorial.[2] Despite the high incidence,[1] the aetiology of AT remains undiscovered making prevention and treatment difficult. With lack of objective measurements of AT severity, the patient-reported Victorian Institute of Sports Assessment (VISA-A)[3] is used for assessment of physical disability due to AT as an outcome measure based on symptoms.

The typical clinical finding of AT is pain in the mid-portion of the Achilles tendon, especially produced by physical activity.[4] As a result of pain AT often causes a reduction in function and activity level with a negative impact on general health and well-being. AT is a clinical diagnosis, and use of power Doppler ultrasound (PDU) for assessment may reveal neovascularisation in patients with AT,[5] providing the ability to offer both diagnostic and monitoring information. Neovascularisation is, on the other hand, not directly related to the patient's symptoms of pain.[6]

Due to the multi-factorial aetiology of AT, health-care providers often resort to multiple approaches to manage the symptoms. When AT is diagnosed, conservative intervention, often including eccentric exercise,[7-9] is preferred over surgical treatment.[10] The aim of all treatment being restoration of patient function to a desired level of physical activity.

Randomised controlled studies (RCTs) try to compare interventions or compare an intervention with placebo. It is difficult to compare the interventions of the various RCTs if the applied outcome measures vary widely and there is not a clear outcome measure.[11] One standardised measure of AT severity which may be used to compare studies, both as a guideline for treatment and for monitoring treatment outcomes, is the VISA-A.[3] In addition to the VISA-A, other outcome measures like the Foot and Ankle Outcome Score (FAOS),[12] clinical tests using ultrasonography and pressure algometry,[13] and visual analogue scoring (VAS) of Achilles tendon pain,[14] have been suggested. Even though a conclusive method of assessment is yet to be found, the self-administered questionnaire the VISA-A, measuring the severity of AT by evaluating pain, function and effect on activity, is at present considered first choice.[3] The VISA-A has been shown to be sensitive to clinical changes and is easily comprehensible to patients, as well as being relevant to clinicians.[14] As a standardised outcome measure, the VISA-A has proven to be a both reliable and valid instrument[3] as shown in the studies where VISA-A has been validated and translated into Dutch, Turkish, German, Italian, and Swedish.[15-19]

The VISA-A is based on an inverted numeric rating scale (NRS) and results in a score range from 0 to 100 points with asymptomatic persons expected to score 100 points. A symptomatic person with severe AT would, on the other hand, be expected to score significantly lower.[3] The VISA-A score is not divided into subgroups, rather it rates the overall effect of AT on a number of activities involving the Achilles tendon. In this systematic review the authors investigated the use of the VISA-A as a measure of the severity of symptoms in AT and as a tool to monitor the change in symptoms and function following interventions provided for the treatment of AT. The aim was to determine the range of the VISA-A scores in a wide range of AT patients, and in healthy individuals. Furthermore, the authors wished to investigate if AT patients after rehabilitation would obtain a VISA-A score comparable to those found in healthy subjects.

The aim of this systematic review was to determine the range of the VISA-A scores reported for varying grades of AT, as well as those reported for healthy subjects, and thereby define the possible limitation of this tool when assessing various rehabilitation schemes, and when defining the score range for healthy controls.

METHODS

A comprehensive, structured literature search was performed. Data mining of selected studies and data analysis were then performed.

Literature Search

The following bibliographic databases were searched: MEDLINE via PubMed from 1950, EMBASE via OVID from 1980, CINAHL via EBSCO from1981, PEDro, Web of Science from 1900, and The Cochrane Central Register of Controlled Trials, each until July 2011.

The following search terms were used: (tendinopath* OR tendonitis OR tendinosis OR achilles*) AND VISA*

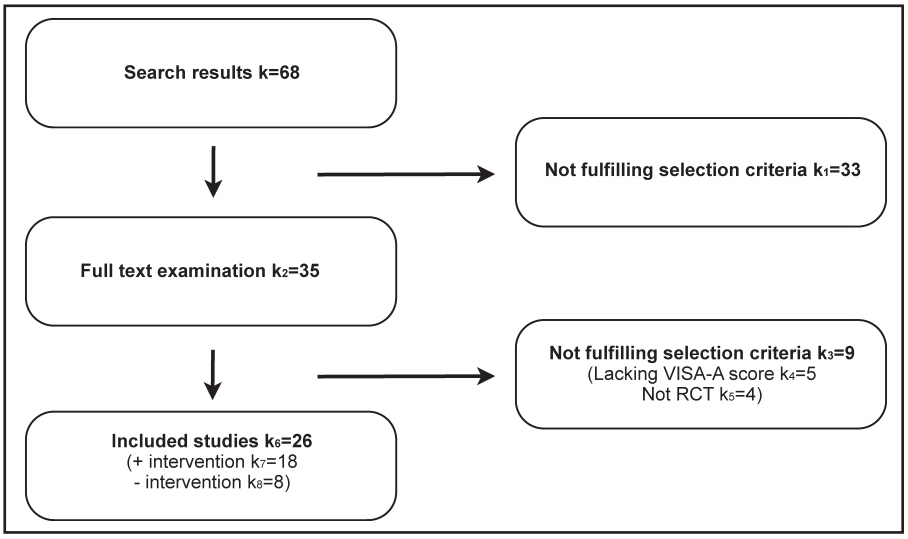

Figure 1. *Selection of included studies.*

used as keywords (where possible) as well as text words. No limitations to the searches were applied.

Reference lists of selected studies were also searched for possible additional appropriate studies.

Inclusion criteria

Trials were included for analysis if they met the following three selection criteria:

1. The study population consisted of men and/or women aged ≥18 years with a diagnosis of chronic non-insertional Achilles Tendinopathy (AT) and/or healthy controls concerning AT
2. Possible intervention was contained in the professional domain of the general-practice physical therapist/medical doctor and included different types of acknowledged treatments of AT
3. The study used the VISA-A as an outcome measure

Data mining and Analysis

Two reviewers (JVI + EMB) independently evaluated all articles for eligibility. Disagreements were resolved by discussion.

Extraction of data from the included trials was carried out independently by reviewers (JVI + EMB). Trials were divided into two groups regarding presence or absence of intervention. The core outcome data in each trial was given as a mean VISA-A score and SD, or range of VISA-A score. Some studies did not give SD or range (marked with * in table 1).

RESULTS

Selection

The systematic literature search resulted in the identification of 68 studies. The selection process is shown figure 1.

Out of the 68 studies, 33 studies (49%) were excluded on the basis of the title and the content of the abstract, the main reasons for exclusion being diagnosis e.g. Patellar tendinopathy or insertional Achilles tendinopathy, or not using the VISA-A questionnaire. Two studies were excluded on the basis of an unclear diagnosis.[20,21] The remaining studies were scrutinized, and 9 additional studies were excluded due to not using or publishing a VISA-A score (k = 5). Also a study protocol, a synopsis, and a two single case studies were excluded (k = 4). Finally the remaining 26 trials[3,5,15-19,22-40], representing 46 different groups of individuals, 39 groups of patients with AT and 7 groups of healthy individuals, were included (Figure 1). These trials were separated into interventional and non-interventional studies and their characteristics are summarized in Tables 1 & 2.

Study characteristics

Overall, the included trials had a total number of participants ranging from n = 5[33] to n = 45[32]. In the studies testing an intervention, the number of included subjects ranged from n = 14[3] to n = 87[3]. The subjects (n = 1336) in the 26 trials consisted of athletes as well as of non-athletes. Altogether 281 healthy individuals and 1055 AT patients were included.

Table 1. *Interventional studies using VISA-A as an outcome measure (n = 18). Total number of participants is 709. VISA-A score is given with SD or range. In 4 studies materials refers to tendons instead of subjects.*

Studies	Participants	Intervention	Pre-VISA-A	Post-VISA-A
de Vos et al. 2010	PRP (n=27) Ctrl(n=27)	24 weeks of EE	PRP: 46.7(16.2) Ctrl: 52.6(19.0)	PRP: 68.4(22.1) Ctrl: 73.1(22.5)
Gaweda et al., 2010	AT (n=15)	PRP. Follow-up; 18 months	24(8-31)	96(80-100)
McAleenan et al. 2010	NS (n=5) Ctrl (n=6)	12 weeks of EE	NS: 67.8(19.9) Ctrl: 42.7(16.1)	NS: 96.6 (33.1) Ctrl: 64.0 (21.4)
Silbernägel et al. 2010	AT (n=34)	12 weeks to 6 months of EE Follow-up; 5 years	56(16)	90(11)
Humphrey et al. 2009	Athletes (n=11)	HVIGI with steroid Mean follow-up; 2,9 weeks	46.3(15.1)	84.1(10.6)
Rompe et al. 2008	SWT (n=34) Ctrl (n=34)	12 weeks of EE Follow-up; 4 months	SWT: 50.2(11.1) Ctrl: 50.6(10.3)	SWT: 86.5(16.0) Ctrl: 73.0(19.0)
de Jonge et al. 2008	NS (n=30) Ctrl (n=32)	12 weeks of EE Follow-up; 1 year	NS: 49.2* Ctrl: 50.1*	NS: 78.2* Ctrl: 75.7*
Maffuli et al. 2008	Athletes (n=45)	12 weeks of EE	36(23.8)	52(27.5)
Chan et al. 2008	AT (n=30)	HVIGI with steroid Mean follow-up; 30,3 weeks	44.8(17.7)	76.2(24.6)
Knobloch et al. 2008	Male (n=38) Female (n=25)	12 weeks of EE	Male: 63(12) Female: 60(14)	Male: 86(13) Female: 75(11)
Tumilty et al. 2007	LLLT (n=10) Ctrl (n=10)	12 weeks of EE	LLLT: 57(16.7) Ctrl: 56.3(19.8)	LLLT: 82.2 Ctrl: 77.5
de Vos et al. 2007	PDU(0) (n=23) PDU(1-4) (n=40)	12 weeks of EE	PDU(0): 55* PDU(1-4): 47*	PDU(0): 74* PDU(1-4): 65*
Silbernägel et al. 2007	CA (n=19) SA(n=19)	6 weeks of CE and EE Follow-up; 1 year	CA: 57(15.8) SA: 57(15.7)	CA: 85(12.7) SA: 91(8.2)
de Vos et al. 2007	NS (n=31) Ctrl(n=32)	12 weeks of EE	NS: 49.4* Ctrl: 50.1*	NS: 67.0* Ctrl: 68.8*
Silbernägel et al. 2006	AT (n=25) Healthy (n=25)	6 months of CE and EE Follow-up;1 year	AT: 56(16.5) Healthy: 99.8(0.8)	AT: 89(10.6) Healthy: 100(0)
Sayana et al. 2006	Non-athletes (n=33)	12 weeks of EE	39 (22.8)	50 (26.5)
Brown et al. 2006	Aprot (n=15) Ctrl (n=18)	12 weeks of EE	Aprot: 59.1* Ctrl: 62.2*	Aprot: 95.4* Ctrl: 94.5*
Lakshmanan et al. 2004	AT (n=16)	SWT. Follow-up; 20.7 months	46.6(11.3)	75.9(19.1)
18 studies	**Total (n=709)**			

PRP= Platelet-rich plasma injections; Ctrl= Controls; EE= Eccentric exercise; HVIGI= High volume image guided injections; NS= Night splint; LLLT= Low level laser therapy; SWT= Shock wave therapy; PDU= Power Doppler ultrasound; CE= Concentric exercise; Aprot= Aprotinine injections; CA= Continued activity; SA= Stopped activity; *Lack of SD or range

In the included studies, the duration of mid-portion Achilles tendon pain ranged from 6 to 26 weeks. Specifications like pain in the morning, pain that impaired performance, and pain on palpation, varied among trials. In most trials, non-insertional tendinopathy was defined as pain located in the area from 2 to 7 cm (a few trials from 2 to 6 cm) proximal to the insertion on the Calcaneus bone. All of the trials

Table 2. *Non-interventional studies using VISA-A (n = 8). Total number of participants is 627. VISA-A score is given with SD or range. In studies where two VISA-A scores were published regarding reliability, only the first VISA-A score was plotted.*

Studies	Participants	VISA-A
Peers et al. 2002	AT(n=25)	AT: 54(12-92)
Silbernägel et al. 2006	AT, LS(n=42) AT, MS(n=42)	LS: 57(15.7) MS: 87(19.8)
Lohrer et al. 2009	AT, C(n=15) AT, P(n=15) HC, J(n=31) HC, S(n=48)	C: 73.1(13.5) P: 44.9(14.2) J: 99(2) S: 98(7)
Dogramaci et al. 2009	AT(n=55) HC(n=55)	AT: 52.9(13.6) HC: 97.1(1.5)
Maffuli et al. 2008	AT(n=50)	AT: 51.8(18.2)
Silbernägel et al. 2005	AT(n=51) HC(n=15)	AT: 50(44-56) HC: 96(94-99)
Robinson et al. 2001	AT, NS(n=45) AT, PS(n=14) HC(n=87)	NS: 64(59-69) PS: 44(28-60) HC: 96(94-99)
de Knikker et al. 2008	AT(n=17) HC(n=20)	AT: 69(16.7) HC: 100(1.5)
8 studies	**Total (n=627)**	

LS= Least symptomatic; MS= Most symptomatic; C= Conservatives; P= Pre-operatives; J= Joggers; S= Students; HC= Healthy controls; NS= Non-surgical; PS= Pre-surgical

included both men and women. Age of the included subjects ranged from 18 to 70 years.

VISA-A mean scores in interventional studies (Table 1)

The author's identified 18 studies with a total of 684 AT patients. In all interventional studies a significant improvement, as operationally defined by the authors in each study, in VISA-A score was demonstrated following treatment (Table 1). A variety of interventions were used in the treatment of AT, with 14 of the 18 included studies (78%) using at least eccentric exercise (EE) in the rehabilitation regime (Table 1). The specific interventions used in the trials are described in Table 1. Pre-treatment mean VISA-A scores for AT patients (n = 684) ranged from 24[28] to 63[30]. Post-treatment mean VISA-A scores for AT patients (n = 684) ranged from 50[35] to 96.6[33]. Improvement in VISA-A score following treatment ranged from 11[35] to 72[28] points. Follow-up time ranged from 2.9 weeks[29] to 5 years[39].

The VISA-A score prior to and following intervention was plotted in a diagram to visualise the present use of VISA-A as an outcome measure in the included studies (Figure 2).

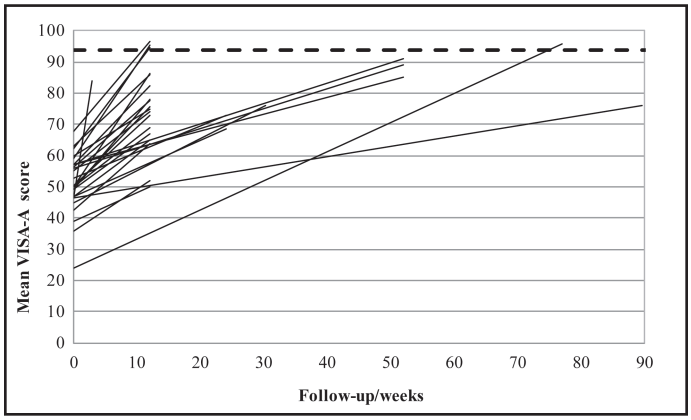

Figure 2. *VISA-A mean scores in interventional studies.*

VISA-A scores in non-interventional studies (Table 2)

Eight non-interventional studies, mostly validity or reliability studies, with 371 subjects looked at VISA-A scores in AT patients. In these studies mean VISA-A scores ranged from 44[3]to 87.[19] Included were the original English VISA-A validation along with the German, Turkish, Italian, Swedish, and the Dutch translations and adaptations of the VISA-A questionnaire.

VISA-A measuring healthy individuals

5 non-interventional[3,15-17,19] and one interventional study[38] contained information of VISA-A scores in 281 healthy individuals. Overall, healthy individuals showed a mean VISA-A score ranging from 96[3,19] to 100.[15]

VISA-A measuring AT severity

The mean VISA-A scores for all AT patients in both interventional and non-interventional studies (26 trials), representing altogether 39 groups and 1055 participants, ranged from 24[28] to 96.6.[33]

The mean VISA-A score range for both AT patients and healthy individuals based on the present studies ranged from 24[28] to 100.[15]

Only two studies reported some AT patients following intervention with a score of 96 or higher, approaching scores reported for healthy subjects (Table 1).[28,33] Patients in these studies had mean VISA-A scores of 96[28] and 96.6.[33]

DISCUSSION

The Victorian Institute of Sports Assessment self-administered Achilles questionnaire (VISA-A) was developed as a tool to evaluate the severity of Achilles tendinopathy (AT) and to facilitate comparison of the effect of different rehabilitation regimes regarding symptoms, function and activity in AT patients. The questionnaire has been proven both a valid and reliable instrument.[3,15-19] The aim of the current systematic review of the application of VISA-A was to determine the range of the VISA-A scores for all presentations of non-insertional AT as well as in healthy individuals. Furthermore, the authors wished to investigate the possibility of AT patients attaining a VISA-A score as high as healthy individuals, indicating excellent recovery after following rehabilitation.

Application of VISA-A

The results of this systematic review indicate that VISA-A scores in AT patients and healthy individuals, ranged from 24 to 100. This means that patients did not report VISA-A scores under 24 in any study, indicating that scores below a 24 on the VISA-A scale are not normally reported by subjects with AT. An explanation of this phenomenon could be that AT patients usually are able to transport themselves to the clinic, all having some mobility, and this would probably also be the case for the participants in the included studies. To get a score of 0-24, the patient would have to be very disabled, more or less having a ruptured tendon, which could not be characterized as having AT. Based on the present results one may therefore assume that AT patients seen in the clinic would not score lower than 24 on the VISA-A, since the patients recruited to the existing studies have AT and not a tendon rupture.

Since healthy individuals showed a mean VISA-A score of 96 or above, the VISA-A is a useful tool for assessment of patients with AT, since the interval for improvement is large (24-96). There is therefore evidence to support that a healthy subject (i.e. subjects without AT), would report a very high VISA-A score, meaning that the validity of VISA-A should be considered high. Only two studies reported AT patients attaining a score as high as 96 or higher after intervention,[28,33] and only one study suggested a VISA-A score value which could be used as indicating the patient having recovered fully. Full recovery was suggested by Yelland et al. as having a VISA-A score of 90 or above,[41] which is close to the reported normal range of 96-100 for healthy controls. This is also in accordance with the study with the longest follow-up of 5 years, where the mean VISA-A score was 90 at follow-up.[39]

In the included studies, scores of 90 or above after intervention may be more likely in studies with a sufficient follow-up period, which was also observed.[28,38,39] This can be explained by the likelihood that a continuous increase in VISA-A score ought to occur following successful intervention.[42]

Success of treatment

Improvement in VISA-A score following treatment ranged from 11[35] to 72[28] points. No minimum clinically

important change (MCIC) regarding the VISA-A score has been set so far. Tumilty et al. suggested success as an increase of 20 points,[40] while other studies used an increase of 12 points as estimated MCIC.[24,35] With no set agreement on the minimal MCIC for the VISA-A score, and with the wide range found in previous works, an estimated MCIC cannot be set based on this systematic review.

Some of the included studies examined whether there was a correlation between the VISA-A score at baseline and chance of recovery (higher VISA-A score after intervention).[23,31,35] One of the included studies showed that a higher VISA-A score prior to intervention did not indicate a significantly better prognosis.[31,35] Furthermore, patients with low VISA-A scores, and hence more severe symptoms, showed the same chance of recovery as patients with an initially higher VISA-A score.[23,35]

Compatibility of studies

In the included studies, number of participants ranged widely from n = 5[33] to n = 45.[32] Several studies had a low number of participants, amongst these were 5 interventional studies containing groups with less than 15 participants.[22,28,29,33,40] These studies with small sample size could suffer from a lack of statistical power.

Furthermore, participants had different previous activity levels, ranging from non-athletes to professional athletes. Since some questions are related to physical activity related to sports participation, and since athletes are more likely to receive a structured rehabilitation and are more motivated to return to their previous activity level,[23] a better recovery (in VISA points) after intervention is more often seen amongst athletic patients.[35] However, included studies used the same definition of chronic mid-portion or non-insertional AT based on clinical findings. In all studies, participants had Achilles tendon pain for at least 6 (range of 6–26) weeks and participants of at least 18 (range of 18–70) years of age were included. In most of the studies, 13 (72%) out of 18 studies, ecentric exercise (EE) was used. This is in agreement with current clinical recommendations of use of eccentric exercise for AT.[7-9]

With a wide range of participants, different previous activity levels, and since some studies gave range and others SD for VISA-A scores, statistical analysis of pooled results was not possible despite an otherwise high homogeneity regarding definition of AT and use of EE in interventional studies. Therefore, only a mean range of VISA-A score was given in this systematic review.

As previously mentioned, some studies had very low numbers of participants.[22,28,29,33,40]

Furthermore, several studies gave mean VISA-A scores with very wide ranges and SD's, indicating great variation in score between patients.[32,33] Despite of this, 23 out of 28 interventional studies showed a pre-treatment VISA-A score between 40 and 60 which is far from the proposed score of 90 for recovery. Also 21 out of 28 interventional studies showed a post-treatment VISA-A score of 70 or higher. This gives a wide range for assessing improvement of AT with VISA-A (24-70), and indicates that VISA-A is able to be used to show meaningful changes. Larger sample-size studies with a longer follow-up are needed in the evaluation of VISA-A as a tool for measuring AT.

CONCLUSION

The VISA-A is a robust tool that has been used extensively for initial assessment of and following treatment for AT. Based on this review, a VISA-A score lower than 24 is not attained in patients with AT. A VISA-A score below 60 is usually found in AT patients while healthy individuals will be in the range above 95. Attaining a VISA-A score over 90 could be considered full recovery from AT, based on the results of this systematic review. This is important in the decision of when an AT patient is well enough to participate in physical activity without limitation, however, this proposed cut score for return to function needs to be further researched.

REFERENCES

1. Kvist M. Achilles tendon injuries in athletes. *Sports Med* 1994; 18(3):173-201.
2. Sorosky B, Press J, Plastaras C, Rittenberg J. The practical management of Achilles tendinopathy. *Clin J Sport Med* 2004; 14(1):40-44.
3. Robinson JM, Cook JL, Purdam C, Visentini PJ, Ross J, Maffulli N et al. The VISA-A questionnaire: A valid and reliable index of the clinical severity of Achilles tendinopathy. *British Journal of Sports Medicine* 2001; 35(5):335-341.

4. Maffulli N, Sharma P, Luscombe KL. Achilles tendinopathy: aetiology and management. *J R Soc Med* 2004; 97(10):472-476.
5. Peers KHE, Brys PPM, Lysens RJJ. Correlation between power Doppler ultrasonography and clinical severity in Achilles tendinopathy. *International Orthopaedics* 2003; 27(3):180-183.
6. Boesen MI, Koenig MJ, Torp-Pedersen S, Bliddal H, Langberg H. Tendinopathy and Doppler activity: the vascular response of the Achilles tendon to exercise. *Scand J Med Sci Sports* 2006; 16(6):463-469.
7. Jonsson P, Alfredson H, Sunding K, Fahlstrom M, Cook J. New regimen for eccentric calf-muscle training in patients with chronic insertional Achilles tendinopathy: results of a pilot study. *Br J Sports Med* 2008; 42(9):746-749.
8. McShane JM, Ostick B, McCabe F. Noninsertional Achilles tendinopathy: pathology and management. *Curr Sports Med Rep* 2007; 6(5):288-292.
9. Roos EM, Engstrom M, Lagerquist A, Soderberg B. Clinical improvement after 6 weeks of eccentric exercise in patients with mid-portion Achilles tendinopathy – a randomized trial with 1-year follow-up. *Scand J Med Sci Sports* 2004; 14(5):286-295.
10. Alfredson H, Cook J. A treatment algorithm for managing Achilles tendinopathy: new treatment options. *Br J Sports Med* 2007; 41(4):211-216.
11. Schulz KF, Altman DG, Moher D. CONSORT 2010 statement: Updated guidelines for reporting parallel group randomised trials. *Int J Surg* 2011; 9(8):672-677.
12. Roos EM, Brandsson S, Karlsson J. Validation of the foot and ankle outcome score for ankle ligament reconstruction. *Foot Ankle Int* 2001; 22(10):788-794.
13. Fredberg U, Ostgaard R. Effect of ultrasound-guided, peritendinous injections of adalimumab and anakinra in chronic Achilles tendinopathy: a pilot study. *Scand J Med Sci Sports* 2009; 19(3):338-344.
14. Kingma JJ, de Knikker R, Wittink HM, Takken T. Eccentric overload training in patients with chronic Achilles tendinopathy: a systematic review. *British Journal of Sports Medicine* 2007; 41(6):e3.
15. de Knikker R, El Hadouchi M, Velthuis M, Wittink H. The Dutch version of the Victoria Institute of Sports Assessment – Achilles (VISA-A) questionnaire: cross-cultural adaptation and validation in Dutch patients with Achilles tendinopathy [Dutch]. *Nederlands Tijdschrift Voor Fysiotherapie* 2008; 118(2):34-41.
16. Dogramaci Y, Kalaci A, Kucukkubas N, Inandi T, Esen E, Yanat AN. Validation of the VISA-A questionnaire for Turkish language: the VISA-A-Tr study. *Br J Sports Med* 2011;45(5):453-455.
17. Lohrer H, Nauck T. Cross-cultural adaptation and validation of the VISA-A questionnaire for German-speaking Achilles tendinopathy patients. *BMC Musculoskeletal Disorders* 2010; 11:37.
18. Maffulli N, Longo UG, Testa V, Oliva F, Capasso G, Denaro V. Italian translation of the VISA-A score for tendinopathy of the main body of the Achilles tendon. *Disability and Rehabilitation* 2008; 30(20-22):1635-1639.
19. Silbernagel KG, Thomee R, Karlsson J. Cross-cultural adaptation of the VISA-A questionnaire, an index of clinical severity for patients with Achilles tendinopathy, with reliability, validity and structure evaluations. *BMC Musculoskeletal Disorders* 6 , 2005. Article Number: 12. Date of Publication: 06 Mar 2005.
20. Longo UG, Rittweger J, Garau G, Radonic B, Gutwasser C, Gilliver SF et al. No influence of age, gender, weight, height, and impact profile in achilles tendinopathy in masters track and field athletes. *The American journal of sports medicine* 2009; 37(7):1400-1405.
21. Van SW, Wiley JP, Brunet G. Achilles tendon pain intensity and level of neovascularization in athletes as determined by color Doppler ultrasound. *Scand J Med Sci Sports* 2007; 17(5):530-534.
22. Brown R, Orchard J, Kinchington M, Hooper A, Nalder G. Aprotinin in the management of Achilles tendinopathy: A randomised controlled trial. *British Journal of Sports Medicine* 2006; 40(3):275-279.
23. Chan O, O'Dowd D, Padhiar N, Morrissey D, King J, Jalan R et al. High volume image guided injections in chronic Achilles tendinopathy. *Disabil Rehabil* 2008; 30(20-22):1697-1708.
24. de-Vos RJ, Weir A, van-Schie HT, Bierma-Zeinstra SM, Verhaar JA, Weinans H et al. Platelet-rich plasma injection for chronic Achilles tendinopathy: a randomized controlled trial. *JAMA : the journal of the American Medical Association* 2010; 303:144-149.
25. de Jonge S, de Vos RJ, van Schie HT, Verhaar JA, Weir A, Tol JL. One-year follow-up of a randomised controlled trial on added splinting to eccentric exercises in chronic midportion Achilles tendinopathy. *British Journal of Sports Medicine* 2010; 44(9):673-677.
26. de Vos RJ, Weir A, Visser RJ, de WT, Tol JL. The additional value of a night splint to eccentric exercises in chronic midportion Achilles tendinopathy: a randomised controlled trial. *Br J Sports Med* 2007; 41(7):e5.
27. de Vos RJ, Weir A, Cobben LP, Tol JL. The value of power Doppler ultrasonography in Achilles tendinopathy: a prospective study. *Am J Sports Med* 2007; 35(10):1696-1701.

28. Gaweda K, Tarczynska M, Krzyzanowski W. Treatment of achilles tendinopathy with platelet-rich plasma. *Int J Sports Med* 2010; 31(8):577-583.
29. Humphrey J, Chan O, Crisp T, Padhiar N, Morrissey D, Twycross-Lewis R et al. The short-term effects of high volume image guided injections in resistant non-insertional Achilles tendinopathy. *J Sci Med Sport* 2010; 13(3):295-298.
30. Knobloch K, Schreibmueller L, Kraemer R, Jagodzinski M, Vogt PM, Redeker J. Gender and eccentric training in Achilles mid-portion tendinopathy. *Knee Surg Sports Traumatol Arthrosc* 2010; 18(5):648-655.
31. Lakshmanan P, O'Doherty DP. Chronic achilles tendinopathy: treatment with extracorporeal shock waves. *Foot and Ankle Surgery* 2004; 10:125-130.
32. Maffulli N, Walley G, Sayana MK, Longo UG, Denaro V. Eccentric calf muscle training in athletic patients with Achilles tendinopathy. *Disabil Rehabil* 2008; 30(20-22):1677-1684.
33. McAleenan M, McVeigh JG, Cullen M, Sayers F, McCrea K, Baxter D. The effectiveness of night splints in achilles tendinopathy: a pilot study. *Physiotherapy Ireland* 2010; 31(1):28-33.
34. Rompe JD, Nafe B, Furia JP, Maffulli N. Eccentric loading, shock-wave treatment, or a wait- and-see policy for tendinopathy of the main body of tendo Achillis: A randomized controlled trial. *American Journal of Sports Medicine* 2007; 35(3):374-383.
35. Sayana MK, Maffulli N. Eccentric calf muscle training in non-athletic patients with Achilles tendinopathy. *Journal of Science and Medicine in Sport* 2007; 10(1):52-58.
36. Silbernagel KG, Gustavsson A, Thomee R, Karlsson J. Evaluation of lower leg function in patients with Achilles tendinopathy. *Knee Surgery Sports Traumatology Arthroscopy* 2006; 14(11):1207-1217.
37. Silbernagel KG, Thomee R, Eriksson BI, Karlsson J. Continued sports activity, using a pain-monitoring model, during rehabilitation in patients with Achilles tendinopathy: a randomized controlled study. *Am J Sports Med* 2007; 35(6):897-906.
38. Silbernagel KG, Thomee R, Eriksson BI, Karlsson J. Full symptomatic recovery does not ensure full recovery of muscle-tendon function in patients with Achilles tendinopathy. *British Journal of Sports Medicine* 2007; 41(4):276-280.
39. Silbernagel KG, Brorsson A, Lundberg M. The majority of patients with Achilles tendinopathy recover fully when treated with exercise alone: a 5-year follow-up. *Am J Sports Med* 2011; 39(3):607-613.
40. Tumilty S, Munn J, Abbott JH, McDonough S, Hurley DA, Baxter GD. Laser therapy in the treatment of achilles tendinopathy: A pilot study. *Photomedicine and Laser Surgery* 2008; 26(1):25-30.
41. Yelland MJ, Sweeting KR, Lyftogt JA, Ng SK, Scuffham PA, Evans KA. Prolotherapy injections and eccentric loading exercises for painful Achilles tendinosis: a randomised trial. *Br J Sports Med* 2011; 45(5):421-428.
42. de Jonge S, de Vos RJ, van Schie HT, Verhaar JA, Weir A, Tol JL. One-year follow-up of a randomised controlled trial on added splinting to eccentric exercises in chronic midportion Achilles tendinopathy. *Br J Sports Med* 2010; 44(9):673-677.