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Three single leg standing tests for clinical assessment of chronic plantar heel pain syndrome: static stance, half-squat and heel rise

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Abstract

Objective To assess reliability and validity of three single leg standing clinical tests in patients with plantar heel pain syndrome (PHPS).
Design Cross-sectional reliability study.
Participants Forty patients diagnosed with PHPS.
Main outcome measures Patients stood on their affected foot in a static stance for up to 30 seconds, a half squat for up to 10 repetitions, and a heel rise for up to 10 repetitions. The first sensation of pain (p1) determined the termination of each test, and established a positive test result. The level of p1 was measured using a visual analogue scale (VAS); time or repetitions for each test were recorded. Prior to performing the tests, all patients completed the Foot & Ankle Computerized Adaptive Test to measure functional status (FS).
Results Detection of p1 in each test showed good reliability for inter- and intrarater assessment (Kappa = 0.60 to 0.78 and 0.56 to 0.77, respectively). The intraclass correlation coefficient for the VAS measures was 0.85 to 0.95 for inter-rater assessment and 0.78 to 0.92 for intrarater assessment. However, the Bland and Altman limits of agreement were wide, indicating that these measures were less reliable than the correlation coefficients suggested. Thirty-five patients (88%) experienced a positive pain response to at least one test. Significant correlations were found between the VAS measures in each test and FS ($r = 0.63$ to 0.72).
Conclusions The static stance, half squat and heel rise tests were easily implemented, and found to be reliable and valid according to one analysis, yet less reliable with another, for pain provocation and VAS levels in patients with PHPS. All three VAS levels correlated well with FS.

Keywords: Half squat; Heel pain; Heel rise; Plantar fasciitis; Static stance

Introduction

Plantar heel pain syndrome (PHPS) is a common foot disorder that causes difficulty in weightbearing functions such as walking and standing, and mainly occurs upon taking the first steps in the morning [1,2]. Approximately 10% of the general population will be affected by PHPS during their lifetime [2]. This syndrome encompasses a broad spectrum of pathologies, with plantar fasciitis being the most common [1]. A diagnosis of PHPS is primarily based on the patient's symptoms in combination with manual palpation of the painful heel area [2,3]. However, validation of this diagnosis by a reliable and quantifiable clinical test is lacking. Various tests have been proposed to aid in the diagnosis and assessment of patients with PHPS, but none have been accepted as the gold standard.

The Windlass test [2,4] is a recognised clinical test for PHPS, described as forced dorsiflexion of the great toe associated with increased pain at the insertion site of the plantar

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fascia. Although this test is specific for PHPS, a low rate of sensitivity was found, thus limiting its value in clinical evaluation [5]. The Clinical Practice Guidelines of the American Physical Therapy Association recommend assessing the patient's function by measuring the level of pain while performing a single leg stance or after walking a specified distance [6]. However, these tests have not been evaluated or standardised in patients with PHPS. Ultrasonography has been identified as a means of PHPS diagnosis and patient assessment [7,8]. A fascia >4 mm thick is considered to be associated with PHPS [7]. However, there is still some controversy about the ability of this imaging modality to identify patients with PHPS, and to reflect meaningful changes as demonstrated in patient self-reported outcomes (PROs) [8–12]. Moreover, this imaging modality is not commonly available to clinicians for onsite assessment of patients.

As objective tests to assess patients with PHPS are limited, intervention studies of patients with PHPS generally employ a PRO as an evaluation tool [2]. Although PROs are ideal for determining an individual's perception of their abilities [13], they do not capture the construct of function completely [14,15]. The PRO is accessible to the clinician, but is mainly applicable for evaluating series of treatments, not individual treatments.

Historically, physical examination tests have been an essential part of clinical assessments [16] as they are readily available and less expensive than diagnostic imaging methods. Evaluation tools that could aid clinicians in establishing a rationale of patient management to communicate with colleagues and patients [17] would be beneficial in determining the patient's status, especially patients with PHPS.

Three clinical tests have been identified to provoke the relevant heel pain in patients with PHPS: single leg static stance [6], single leg half squat [18] and single leg heel rise [18,19]. These three tests were combined in this study in order to enhance the possibility of attaining a positive test response from each patient. The aim of this study was to investigate whether these tests would be reliable and valid in patients with PHPS.

Methods

This was a cross-sectional reliability study.

Participants

A sample of 40 patients was chosen to detect the reliability of an intraclass correlation coefficient (ICC) of 0.8 at 5% significance, power of 80% [20] and confidence interval (CI) width of 0.24. Data were collected prospectively from consecutive patients (age >18 years) diagnosed with PHPS and referred to two local physiotherapy outpatient clinics by a physician/orthopaedic surgeon for treatment. Recruitment took place from November 2012 to November 2013.

The following inclusion criteria were used: (1) local heel pain triggered by first steps in the morning, lessening after a short period of walking; (2) pain absent in non-weightbearing positions to establish a pain-free situation before testing; (3) chronic pain present for more than 3 months [21] to assess patients in a stable pain situation; and (4) pain in one foot to enable pretest trials on the pain-free contralateral foot. Exclusion criteria were insufficient communication skills and the following medical conditions: tumour, fracture, systemic arthritic condition, osteoporosis, prolonged history of steroid use or severe vascular disease, diabetes, prior surgery in the lower leg, pain in a proximal area of the affected lower limb or lower back structures that could refer pain to the heel, and patients undergoing other treatments that could affect heel pain. All patients enrolled voluntarily in the study and provided informed consent. The study was approved by the Institutional Human Study and Ethics Review Boards (Serial Number 30/2012). Reporting is in accordance with proposed standards for reporting diagnostic accuracy studies [22].

Measures

The main measure for each test was the manifestation of the first painful sensation (p1), indicating a positive clinical sign, thus determining termination of the test. The level of pain, as reported by the patient, was recorded using a 10-cm visual analogue scale (VAS) at the conclusion of each test. The VAS, described elsewhere [23], has been found to be reliable [24,25] and valid [25,26] for the measurement of pain. The level of achievement of performance parameters was also recorded at the conclusion of the test.

The patient's functional status (FS) was quantified using the Foot & Ankle Computerized Adaptive Test (Focus On Therapeutic Outcomes, Inc., Knoxville, TN, USA) [27] prior to physical examination. Each patient completed the test independently. Raters were unaware of the results. FS scores ranged from zero (low) to 100 (high), based on the Lower Extremity Functional Scale [28]. Validity, sensitivity to change and responsiveness of the foot- and ankle-specific FS measures have been described elsewhere [29]. The Lower Extremity Functional Scale is recommended for the assessment of patients with PHPS [2], and was employed as the reference standard in this study.

Demographic information collected from each patient at initial examination included duration of symptoms (weeks) and dominant work activity. Information regarding sports participation was gathered from the FS questionnaire.

Procedures

Patients were assessed while standing using the static stance, half squat and heel rise clinical tests (Fig. A, see online supplementary material). To clear the pain-free foot from contact with the floor, the patient lifted the leg by flexing the knee. The patients touched the examiner's shoulder with a single finger to maintain balance [30]. If the examiner