DOI: 10.30651/jqm.v8i01.18628

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Case Report

Calf stretch effectiveness in plantar fasciitis cases: A case series

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ARTICLE INFO

Submitted : 26th May 2023
Accepted : 26th October 2023
Published : 25th January 2024

Keywords:

Plantar Fascitis, High Arch Foot, Calf stretch exercise, AOFAS Score

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ABSTRACT

Plantar fasciitis in Indonesia mainly occurs after 30 years of age, and 77% of sufferers are between 40 to 69 years old. The ratio of men to women prevalence is 1:2. Some risk factors of plantar fasciitis include structural abnormalities, being overweight, age-related degenerative changes, activities that require prolonged standing and/or ambulation, and errors in training, especially in athletes. We present 20 case series of all patients diagnosed with plantar fasciitis and underwent conservative management with Calf Stretch workouts for 30 days in Orthopedic Polyclinic RSUD Dr. Soetomo 2018-2019. AOFAS Score was evaluated for all patients. Calf stretch exercises in which the patient stands with the sore leg behind and both hands pushing against a wall, also known as the wall stretch. This exercise is performed twice daily for 10-15 minutes each session. This exercise is done routinely for 30 days. A simple, progressive training protocol consisting of strength training with heavy weights will produce better results in the first three months when compared to plantar-focused stretching. It may aid in more rapid relief of pain symptoms. Conservative management with calf exercises may provide a good outcome in patients with plantar fasciitis, based on the AOFAS score.

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INTRODUCTION

Plantar fasciitis is one of the most common non-traumatic and non-inflammatory plantar conditions urging patients to health care visits (Rasenberg et al., 2019; Trojian & Tucker, 2019). The estimation of plantar fasciitis prevalence reaches 11% of the worldwide population (Trojian & Tucker, 2019). The majority of plantar fasciitis sufferers are women with obesity, especially those aged 40-60 years (Trojian & Tucker, 2019). Plantar fasciitis also often occurs in athletes and the geriatric population. It may be associated with structural abnormality, overweight/obesity, age-related degenerative changes, overuse or error in training, especially in athletes (Purvitagiri et al., 2017; Rasenberg et al., 2019; Sutanto & Sidarta, 2022; Trojian & Tucker, 2019). Overpronate due to the limitation of ankle dorsiflexion is also associated with plantar fasciitis as it poses more load to the plantar fascia (Trojian & Tucker, 2019).

Commonly, patients with plantar fasciitis come with sharp pain, especially in the anteromedial area of the heel (Muth, 2017). When pressure is applied to the foot, the medioplantar region is the most common site that elicits pain. Plantar pain usually will be felt during ambulation after a period of inactivity and will be improved as the activity continues. Pain that begins at the first step in the morning is considered a classic presentation of plantar fasciitis and may also come at the end of the day (Trojian & Tucker, 2019). Parasteshia is uncommon. More than 50% of plantar fasciitis patients have calcaneal spurs. If not treated well, plantar fasciitis can cause chronic pain and plantar keratosis, interfering with patients' functional activity and quality of life (Latt et al., 2020).

Treatment of plantar fasciitis consists of operative and non-operative management. Non-operatively, it is done by biomechanical manipulation for gait errors, local injection of steroids, and the role of physiotherapy is to reduce pain using manuals and therapeutic modalities (Latt et al., 2020). Physiotherapy management that can be used in cases of plantar fasciitis is in the form of the use of the latest physiotherapy modalities, namely microwave diathermy (MWD), transcutaneous nerve electrical stimulation (TENS) and ultrasound (US) with direct contact methods in the form of gels and indirect contact in the form of water (sub aquaqual) as well as transverse friction and active stretching in the dorsal flexion position of the ankle which aims to vascularize with a thermal effect that will reduce pain in the plantar area of the foot (Latt et al., 2020; Trojian & Tucker, 2019). Calf stretch is one of the most simple and affordable non-operative managements for plantar fasciitis that is suitable for patients, especially in developing countries. This case series aims to report the effectiveness of calf stretch in treating plantar fasciitis patients.

CASE SERIES

We present 20 case series of all patients diagnosed with plantar fasciitis who went to the Orthopedic Polyclinic in 2018 and 2019 that received conservative management with Calf Stretch workouts for 30 days and were evaluated with AOFAS Score (Van Lieshout et al., 2017). Most patients are female (14/20 cases), while the male sex only constitutes 6/20 cases. All the patients come with unilateral heel pain as the chief complaint, ranging from one week to six months from the onset of pain. Although most cases said their regular exercise is a morning walk, they rarely do it. Obesity, diabetes mellitus, and hypertension are absent in all included cases. In addition to NSID, all the

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Table 1. Case Series of 20 patients With Plantar Fascitis

No	Identity	Occupation	Symptom	Exercises	Past History	Diagnosis	Therapy	AOFAS score
1	Male, 30 yo	field-building foreman	Pain in the heel of the left leg for 4 months.	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis sinistra	Conservative, independent calf stretch exercises for 30 days	100
2	Female, 50 yo	housewife, not wearing high heels	Pain in the heel of the right leg for 2 months,	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis dextra	Conservative, independent calf stretch exercises for 30 days	89
3	Female, 52 yo	housewife, not wearing high heels	Pain in the heel of the right leg for 3 months.	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis sinistra	Conservative, independent calf stretch exercises for 30 days	99
4	Female, 39 yo	housewife, not wearing high heels	Pain in the right heel for 1 month.	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis dextra	Conservative, independent calf stretch exercises for 30 days	98
5	Female, 34 yo	housewife, not wearing high heels	Pain in the heel of the right leg has been 1 week	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis dextra and High arch foot dextra	Conservative, independent calf stretch exercises for 30 days	88
6	Female, 51 yo	housewife, not wearing high heels	Pain in the heel of the right leg has been 1.5 months	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis dextra and High arch foot dextra	Conservative, independent calf stretch exercises for 30 days	92
7	Female, 37 yo	housewife, not wearing high heels	Pain in the heel of the right leg has been 1.5 months	routinely running and gymnastics 2 times a week	No obesity, DM, or Hypertension	Plantar Fascitis pedis dextra	Conservative, independent calf stretch exercises for 30 days	98
8	Female, 75 yo	teaching lecturer, wearing high heels	Pain in the heel of the left leg for 2 months	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis dextra	Conservative, independent calf stretch exercises for 30 days	88
9	Male, 36 yo	factory employee	Pain in the heel of the right leg for 5 months	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis sinistra	Conservative, independent calf stretch exercises for 30 days	98
10	Female, 57 yo	housewife, not wearing high heels	Pain in the heel of the right and left leg for 6 months	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis bilateral	Conservative, independent calf stretch exercises for 30 days	89

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11	Male, 54 yo	Employee	Pain in the heel of the right and left leg for 2 months	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis dextra	Conservative, independent calf stretch exercises for 30 days	90
12	Female, 41 yo	housewife, not wearing high heels	Pain in the right heel for 1 month	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis dextra	Conservative, independent calf stretch exercises for 30 days	100
13	Male, 54 yo	Employee	Pain in the heel of the right and left leg for 5 months.	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis sinistra	Conservative, independent calf stretch exercises for 30 days	100
14	Female, 56 yo	housewife, not wearing high heels	Pain in the heel of the right leg for 3 months	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis sinistra and High arch foot sinistra	Conservative, independent calf stretch exercises for 30 days	81
15	Female, 24 yo	student, wearing high heels	Pain in the heel of the right and left foot for 3 months	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis bilateral	Conservative, independent calf stretch exercises for 30 days	89
16	Female, 49 yo	housewife, not wearing high heels	Pain in the heel of the right and left foot for 6 months.	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis sinistra.	Conservative, independent calf stretch exercises for 30 days	99
17	Male, 51 yo	Building shop owner	Pain in the heel of the right and left leg for 12 months	jogging and sometimes playing badminton regularly	No obesity, DM, or Hypertension	Plantar Fascitis pedis bilateral	Conservative, independent calf stretch exercises for 30 days	99
18	Female, 43 yo	housewife, wearing high heels	Pain in right heel for 1 month.	exercises yoga once a week	No obesity, DM, or Hypertension	Plantar Fascitis pedis dextra	Conservative, independent calf stretch exercises for 30 days	88
19	Female, 43 yo	housewife, wearing high heels	Pain in right heel for 6 months.	routinely exercises yoga and Pilates 1 time a week	No obesity, DM, or Hypertension	Plantar Fascitis pedis dextra and High Arch foot dextra	Conservative, independent calf stretch exercises for 30 days	83
20	Male, 51 yo	building foreman	Pain in the heel of the right and left leg for 4 months	Morning walk, Rarely	No obesity, DM, or Hypertension	Plantar Fascitis pedis bilateral	Conservative, independent calf stretch exercises for 30 days	88

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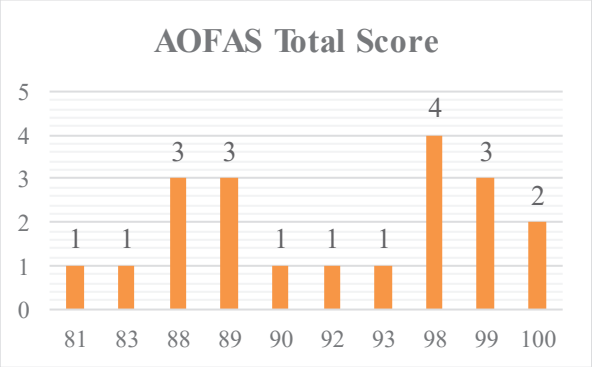

Figure 1. AOFAS Total Score

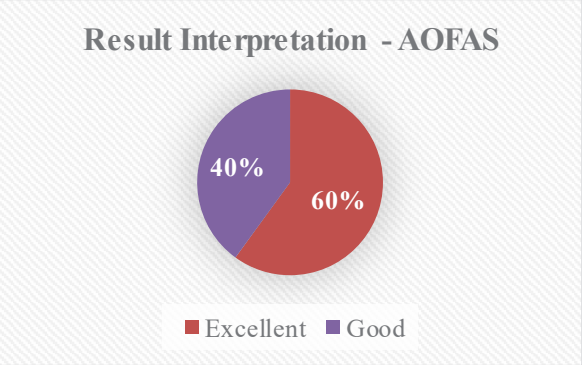

Figure 2. AOFAS Score Result Interpretation

Out of 20 patients, the AOFAS score ranged from 81 to 100. Most cases pose a 98 score (three cases), followed by 99, 98, and 88, which consist of three cases on each. Figure 1 presents the AOFAS score of 20 patients in this case series.

All plantar fasciitis patients in this case who underwent conservative therapy with calf stretching obtained an improved outcome of the AOFAS score with a score above 80. The percentage of patients with good and excellent AOFAS scores is 40% and 60%, respectively (Figure 2). None of the patients is categorized as having moderate or low AOFAS scores.

DISCUSSION

We included all patients diagnosed with plantar fasciitis and underwent calf stretch conservative management in orthopedic polyclinic RSUD Dr. Soetomo in 2018 and 2019. Calf stretch treatment is an exercise in which the patient stands with the sore leg behind and both hands pushing against a wall. This exercise is also known as the wall stretch. This calf stretch exercise is performed two times a day in the morning and evening for 10-15 minutes each session. This exercise is done routinely for more or less than 30 days (Trojian & Tucker, 2019). The outcomes of patients were then evaluated by AOFAS score (Van Lieshout et al., 2017).

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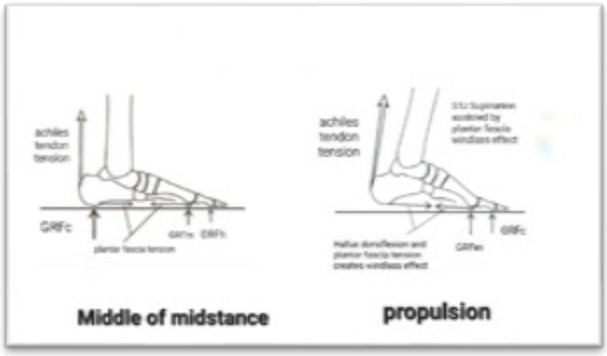

Figure 3. Shortening/tightness of the triceps surae when weight bearing (mid stance).

Plantar fasciitis is one of adults' most common plantar diseases (Trojian & Tucker, 2019). Plantar fasciitis occurs in the age range from teenagers to older people and can occur in someone who often performs heavy work or not (Rasenberg et al., 2019). Although the exact cause remains unclear, the most common theory is a recurrent partial tear and chronic plantar fascia inflammation at the insertion of the medial calcaneus tubercle(Purvitagiri et al., 2017; Rasenberg et al., 2019). Non-operative management of plantar fasciitis varies widely, including shoe modification, stretching exercises, physical therapy, nonsteroidal anti-inflammatory drugs, cortisone injections, plaster casts, or a combination (Trojian & Tucker, 2019).

Some risk factor data from 20 patients, namely mechanical loads, as much as 85% (17 patients) had a history of standing too long, wearing high heels, and long-term exercise routines. 57% (12 patients) had a Body Mass Index (BMI) above 25.00 (obese), and 43% (9 patients) had a normal BMI, while there were no patients with a BMI below 18.50.

It was mentioned that a history of routine activities that require weight bearing is a common risk, especially for patients with a history of frequent running or walking activities for a long time where these activities cause microtrauma to the plantar fascia and provide a burden that exceeds the body's capacity to withstand stress recover (Lim et al., 2016). Plantar fasciitis, on average, occurs in adults to older people. This is following the data collected, namely two young adult patients (10%), 11 old adult patients (55%), and seven elderly patients (35%). The data can be seen in Table 1. Macklin et al. stated that the average age of patients with plantar fasciitis who had undergone calf muscle stretching training was old adults to older people (Macklin et al., 2012). Research conducted by Cheng et al. stated that the thickness of plantar fasciitis increases and the echogenicity decreases with age, which projects that the aging process may play a role in the occurrence of plantar fasciitis in that age range(Cheng et al., 2014). Higher echogenicity in women is caused by a strong association with aging (Bauer et al., 2015).

Plantar fasciitis is aponeurosis with thickening of the tissue originating from the medial calcaneal tubercle and forming the longitudinal arch of the foot forward(Moore et al., 2014). The function of the plantar fascia is to provide static longitudinal arch support and dynamic shock absorption. Individuals with pes planus (low arch or flat feet) or pes cavus (high arch) are at increased risk of developing plantar fasciitis. This is also following data from 20

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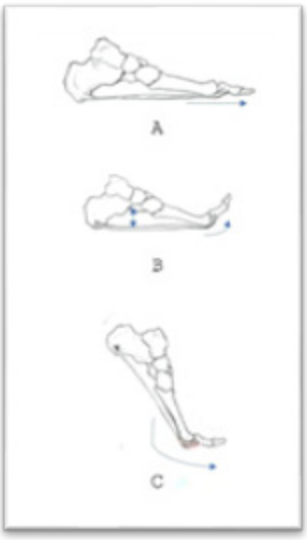

Figure 4. Shortening/tightness of the triceps surae so that when weight bearing (mid-stance), the calcaneus is retracted posteriorly, causing a pull at the insertion site of the plantar fascia. That explains women, whose average footwear has a higher heel height than men's footwear.

patients where three patients had an abnormal shape of the soles of the feet while the other patients did not have deformities.

In this case series, most patients with plantar fasciitis are career women officer women who often wear high heels. The habit of using a high heel may cause shortening/tightness of the triceps surae and pulling of the insertion site of the plantar fascia. During the propulsion phase, when toe-off occurs, hallux dorsiflexion occurs, and the plantar fascia's tension causes a windlass effect (Figures 3 and 4).

In general, plantar fasciitis is a self-limiting condition. Unfortunately, treatment times ranging from six to 18 months can be frustrating for patients and doctors. Rest is the treatment that is often suggested in several studies with high success rates. Sports athletes, active adults, and people whose jobs require a lot of walking may not comply if ordered to stop all activity. Many sports medicine doctors have found that providing an elaborate "relative rest" plan that replaces alternative activities that exacerbate symptoms increases treatment adherence rates (Stecco et al., 2013).

The management of the patients, in this case, is to provide a stretching and strengthening program that plays an essential role in the treatment of plantar fasciitis and can improve functional risk factors such as tension of the gastrocsoleus muscle complex and weakness of the intrinsic leg muscles due to the importance of increasing the flexibility of the calf muscles. One of the most frequently used stretching techniques is stretching on walls and stairs. A clinical scoring system published by the American Orthopedic Foot and Ankle Society (AOFAS), the AOFAS Ankle-Hindfoot Scale, is one of the most widely used assessment tools in measuring treatment outcomes in patients with ankle or hindfoot injuries (Van Lieshout et al., 2017).

The reliability and responsiveness of the Indonesian version of the FAOS are considered acceptable, with reasonable construct validity. Nevertheless, certain items within the pain

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and OS (Four things within the pain subscale and two within the Other Symptoms (OSs) subscales did not align perfectly with their respective original subscales) may warrant further exploration and enhancement (Adhitya et al., 2021). Consequently, this study continues to employ the American version for scoring purposes.

De Boer et al. stated that the clinical scoring system combines subjective scores of pain and function obtained from patients and objective scores based on the doctor's physical examination (i.e., gait, sagittal movement, hind leg movement, rear-ankle stability, and body alignment) (Deboer & Gurka, 2017).

The AOFAS questionnaire includes nine items which can be divided into three subscales (pain, function, and harmony). Each of the nine items is scored, accumulating into a total score ranging from 0 points (indicating severe pain and impairment) to 100 points (no symptoms or impairment) (Van Lieshout et al., 2017).

Patient data shows that from the AOFAS scores that have been carried out, the three subscales showing the pain scale (Pain) obtained as many as 55% (11 patients) with a score of 40 and 45% of patients (nine patients) with a score of 30, while on other scores there were no patients. The function scale found that 40% of patients (eight patients) had a score of 43, 35% (seven patients) had a score of 44, and as many as 25% had a score of 45. A total of 20 patients with a total score of the highest number of patients, namely a total score of 98 were obtained in four patients, and 88, 89, and 99 scores in three patients of each. Two patients have a score of 100, and one has scores of 81, 83, 90, 92, and 93.

Research by Ceccarelli et al. stated that the AOFAS score alone cannot assess important aspects of the final health status of patients treated for Achilles tendon rupture (Ceccarelli et al., 2014). Significant correlations of the AOFAS subscales suggest that the AOFAS ankle-hindfoot score overemphasizes scores associated with a single parameter (pain) and overrides other vital parameters such as muscle strength function (essential in evaluating treatment outcomes) or stiffness or deformity and may influence the final result. This may lead to the conclusion that SF-36 alone can be used as a method of monitoring outcomes after surgical Achilles tendon repair (Thompson et al., 2014).

Nevertheless, the SF-36 is a generic assessment tool and is not suitable for specific objective clinical changes, and the AOFAS score helps assess the effectiveness of surgical techniques (Ling & Wang, 2018). This reflects the surgeon's satisfaction or dissatisfaction and may affect the indications and benefits of surgery. In contrast, the SF-36 conveys the general health status of the patient after surgery and considers mental health, psychological condition, and general physical functioning. It reflects patient satisfaction or dissatisfaction and is an essential tool for evaluating the results of all types of surgery. This is consistent with other researchers who believe that neither the SF-36 nor the AOFAS should be used separately for assessing the foot (Ling et al., 2018). Ceccarelli et al. suggested that using these two criteria can help show the results of AOFAS in assessing post-treatment improvement results (Ceccarelli et al., 2014). The results of the interpretation of the AOFAS score in the case report showed that 60% of patients (12 patients) showed "Excellent" results, and 40% of patients (8 patients) showed "Good" results. Rathleff et al. stated that patients with plantar fasciitis feel that this disease is debilitating because activities that require weight bearing can trigger plantar fasciitis symptoms. Therefore, this high-strength, simple-load training

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intervention is relevant because it can reduce pain and symptoms three months faster than plantar-specific stretching. Also, it takes only a short time to complete, and when compared to plantar-specific stretches, it only needs to be done every second day (Rathleff et al., 2015).

A simple, progressive training protocol consisting of strength training with heavy weights, when done every second day, will produce better results in the first three months when compared to plantar-focused stretching and may aid in more rapid pain relief and increased function. However, there was no significant benefit from strength training with heavy weights at the end of the first, sixth, and 12th months. This study adds new evidence about the positive effect of simple activity performed progressively on debilitated and severe patients. Our trial had some limitations due to the limited number of patients involved and the absence of a pre-exercise score for comparison with post-treatment assessments using the AOFAS Score. This aspect should be taken into account in future research endeavors.

CONCLUSION

Based on the AOFAS score, conservative management with calf exercises provides a good outcome in patients with plantar fasciitis. It could be one possible alternative to non-operative modality that can contribute to improvement in patients with plantar fasciitis.

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