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SONOGRAPHIC EVALUATION AND LITERATURE REVIEW OF PLANTAR FASCIITIS – A CASE STUDY APPROACH

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ABSTRACT

Despite being a common disorder, plantar fasciitis or fasciopathy, and its associated pain and disability remain largely unreported in our environment We present the classical sonographic features and the use of physiotherapy techniques in conservative management in a case study of a 66-year-old female patient with suspected plantar fasciitis. The common causes, risk factors, and treatment methods are highlighted in our literature. Our paper advocated the use of ultrasound as a first-line diagnostic imaging modality when plantar fasciitis is suspected, due to its affordability and availability.

Keywords: sonography, plantar fasciitis, case study

Introduction

Plantar fasciitis is described as a disorder of plantar aponeurosis, which affects the biomechanics between the calcaneum and the metatarsals and may interfere with normal daily activities due to the resultant pain and discomfort (Ferdinando et al, 2017; Theodorou et al, 2002). Despite being a common disorder, it is still underreported in Nigeria considering the significant number of people who commute on foot. Many authors have reported the possible causes of plantar fasciitis; which includes inflammatory changes (Davis et al., 2020), re-traumatization of plantar aponeurosis (Riddle and Schappert, 2004), degeneration and fibroblastic changes or proliferation (Ahuja, 2007; Karabay et al, 2007). Repetitive injuries may lead to chronic inflammatory response, which worsens with continuous strain, especially in overweight individuals (Genc et al, 2005; Ferdinando et al, 2017). Hence the terms such as Jogger's heel, tennis heel, policeman's heel, or heel spur syndrome are used to describe this entity. Perhaps, to accommodate the various range of changes due to over-use, the term 'fasciopathy or plantar fasciosis' have been canvassed (Rompe et al, 2007). The reported prevalence in the general population ranges from 4% to 10%, especially among athletes, obese individuals, and vocations that require prolonged standing (Menz et al., 2021). Many risk factors are implicated which may include age, body mass index (BMI), abnormal foot anatomy such as pes planus or history of diabetes and arthritis (van Leeuwen, 2016; Coca et al., 2018). Other factors extrinsic to the patient may include excessive athletic activity and choice of footwear (Said et al., 2020; Kiristsi et al, 2010, Buchanan et al., 2021, Brennan et al., 2022).

The symptoms and signs include pain, local tenderness or stiffness, more pronounced in the mornings. In addition, patients find it difficult to flex the adjacent ankle joint (Schwartz and Su, 2014; Davis et al., 2020). Diagnostic imaging such as plain radiographs of the

foot, musculoskeletal ultrasound and MRI are often required for differential diagnosis (Ferdinando et al, 2017; Lentz et al., 2019, Eagle et al., 2020). Ultrasound is preferred in our environment due to its cost and availability and is particularly useful in inflammation as well as in guiding interventions (Menz et al. (2021). The technique is best performed with a Linear probe with a frequency range of 5-15 MHz. Doppler interrogation is useful in identifying inflammation or proliferative changes. A typical ultrasound examination involves a thorough assessment of the plantar aponeurosis, beginning from its origin on the dorsum of the calcaneum to the plantar surface of the foot, up to the deep fascia of the metatarsals. Abnormal Thickness, reduced echogenicity and presence of vascularity, peri-fascial edema, calcaneal spurs and ruptures of the plantar fascia are possible findings (Monteagudo et al., 2018; Karabay et al., 2020; Wearing et al, 2007).

Plantar fasciitis can be treated through physical manipulations, use of orthotic devices and the injection of steroids (Liu et al., 2023; Martin et al., 2022). Surgical procedures such as fasciotomy and resection of spurs may be performed when other options fail (Kilmartin et al. (2020). Response to treatment is measured by significant pain relief and improved outcomes within 6 to 12 months. (Lee et al. (2021). Furthermore, reducing or eliminating risk factors is important to avoid recurrence (Harrison et al., 2023). Our case study approach aims to present the clinical and classic sonographic findings and encourages practitioners to utilize ultrasound as a frontline modality in the diagnosis of suspected plantar fasciitis.

Case report

A 66-year-old, obese, female patient with a 6-week history of left Achilles /heel pain, presented for ultrasound. The patient had a history of a fall, 6 weeks before presenting for ultrasound examination. The patient complained of increased pain while at work because of standing for long periods but which had subsided over time. A body mass index of 32.1 was recorded for this patient.

No previous evaluations or interventions were reported. The provisional clinical diagnosis was Achilles tendon tear and/or plantar fascia pathology.

Ultrasound Investigation

Ultrasound scan was performed using a high frequency (10-13MHz) linear probe of a GE Logic E Ultrasound unit. The patient was scanned lying prone and the feet hanging free in a neutral position (0-degree dorsi flexion and plantar flexion). The examiner was seated at the end of the couch to allow good access to the Achilles tendon and plantar aspect of the foot. Both feet were examined for comparative evaluation. It was necessary to maintain reasonable transducer contact with the subject (without undue pressure) and ensure the ultrasound beam was directed at a right angle to the tendon/ligament to avoid errors secondary to anisotropy. The left Achilles tendon was scanned in longitudinal and transverse planes from its origin at the gastrocnemius and soleus muscles to its insertion at the calcaneum. Paratendinous structures were also examined.

The plantar fascia was scanned essentially in the longitudinal plane and traced from its origin on the undersurface of the foot at the calcaneum, extending from the entire plantar aspect of the foot to the deep fascia underlying the metatarsal heads. The thickness of the plantar fascia was measured (from the longitudinal section) at a standard reference point of about 5mm from the calcaneum (Wearing et al, 2007). Overlying subcutaneous tissue was also examined for possible cellulitis.

Results

Ultrasound investigation of the Achilles tendon and paratendinous structures revealed no abnormality. The thickest part of the Achilles tendon in the distal one-third measured 6mm in sagittal section. No obvious retro-Achilles and pre-Achilles bursitis or enthesopathy were noted. The plantar fascia on ultrasound appeared thickened and relatively hypoechoic measuring 9mm in thickness in sagittal section at about 5mm from the os calcis. The reflectivity appeared conspicuously reduced when

compared to the right (asymptomatic) side (Figure 3). There was loss of normal fibrillar echopattern in the plantar fascia and Doppler interrogation did not show any vascularity (Figures 1 & 2). Subtle irregularity of the underlying bone articular surface was noted as possibly indicative of enthesopathy. The overlying soft tissue appeared sonographically normal and no findings suggesting oedema or cellulitis were seen. The right plantar fascia was unremarkable and appeared normal in thickness measuring 3mm. Ultrasound diagnosis was left plantar fasciitis with suggestive enthesopathy.

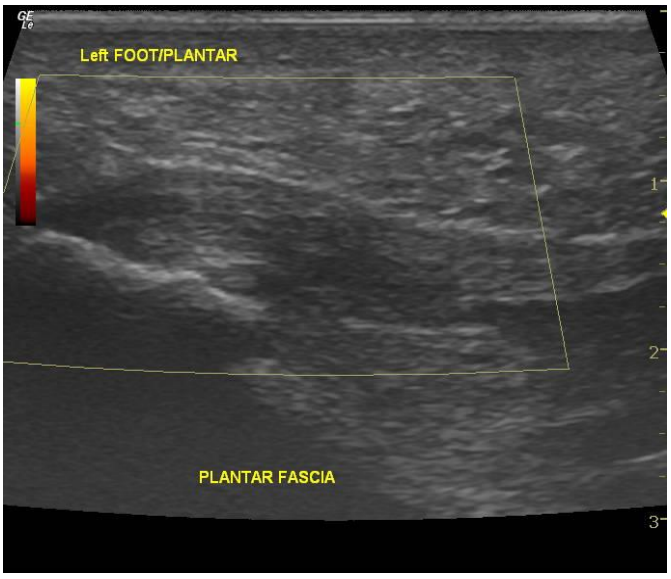

Figure 1: Left plantar fasciitis in a longitudinal view. It is thickened and shows no vascularity on power Doppler study

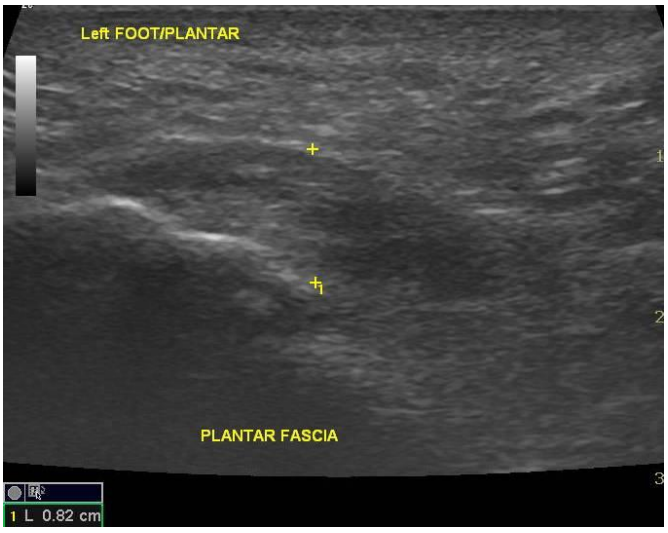

Figure 2: Plantar fascia appears thickened and relatively hypoechoic, with loss of normal fibrillar echopattern. Overlying soft tissue appears sonographically normal

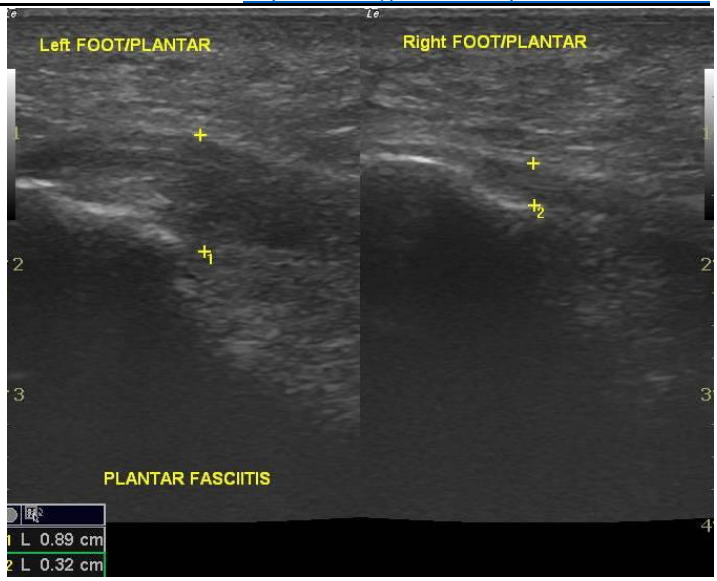

Figure 3: Comparative longitudinal split-screen images of the left and right plantar fascia. The right plantar fascia appears normal in thickness (3mm) and echopattern compared to the left (9mm). Subtle irregularity of underlying bone articular surface noted in the left foot/plantar.
X^2 – Chi square

Discussion

Our patient experienced heel pain as a primary symptom, commonly associated with Plantar fasciitis (Monteagudo et al., 2018; Trojian et al., 2019). The risk increases in patients with obesity and foot-related deformities such as pes planus, pes cavus, foot pronation, heel valgus, and extended flexion of the ankle joint (Digiovanni et al., 2021). The risk of obesity is compatible with our patient who has a BMI of 32.

No studies in our region have established the pattern of prevalence, but 3.6% and 7% have been reported among Australian and American populations respectively (Riddle et al., 2018).

It is generally agreed that an ultrasound finding of a thickened plantar fascia (more than 4 mm) with associated loss of normal fibrillar echo pattern are diagnostic of fasciitis (Monteagudo et al., 2018). As seen in the case under review, the plantar fascia appeared thickened with a diameter of 9mm and significantly reduced in echogenicity compared to the contralateral side. To improve the confidence level of diagnosis, Karabay et al. (2020) suggested the comparison of plantar fascia thickness with the contralateral foot. In this case, the patient's ultrasound images showed that the left plantar fascia was obviously thicker (9mm) and more hypoechoic than the

right which measured (3mm thick). Athough the presence of vascularity on Doppler is not a necessary criterion for diagnosis, it may be an indication of concurrent inflammation. In our case, no vascularity was seen on Doppler in this patient. Digiovanni, et al (2021) have reported a positive correlation between the degree of pain and hyperemic changes as demonstrated by power Doppler. Other findings typical in re-traumatized cases such as peri-fascial edema and calcaneal spurs were absent in this case (Monteagudo et al., 2018). Furthermore, no evidence of calcaneal spurs, peri-fascial edema, or partial ruptures of the plantar fascia was seen in our case (Karabay et al., 2020). Plain film radiography was considered unnecessary and indeed may be unhelpful in making an initial diagnosis, except in cases with calcaneal spurs.

MRI and bone scintigraphy have been suggested as additional modalities in diagnosis (Kane et al., 2019; Sutera et al., 2020) but were not available for our case. MRI is beneficial in the evaluation of the structure, thickness, and signal intensity of the plantar fascia. Ultrasound remains the preferred modality because it is cheap, non-invasive, and provides a simple guide during steroid injections (Uden et al., 2018). The use of ultrasound guidance allows precise injections and reduces the risk of complications such as post-intervention fat pad atrophy. Furthermore, ultrasound may identify the presence of nodules typical of fibromatosis. (Karabay et al., 2020). The presence of fusiform hypoechoic nodules was not observed in this patient.

Clinical Management

Our patient opted for conservative management and received significant pain and symptom relief after 4 weeks of physiotherapy visits. Although no corticosteroids were injected into our patient, ultrasound is considered invaluable before, during, and after follow-up treatment. Blind injections typically result in a low success rate and the potential risk of injecting into the fat pad (Tsai et al, 2005)

It is recommended that ultrasound follow-ups are performed to exclude fascia rupture, peri-bursal oedema, partial tear and calcaneal spur (Kane et al, 2001).

Conclusion

Our case study has demonstrated the classical ultrasound findings associated with Plantar fasciitis. The diagnosis of plantar fasciitis was made because of clear-cut sonographic features hence no further imaging/investigation was suggested in our patient.

We have also demonstrated that conservative management may suffice in many instances, thus providing an easy, relatively cheap, and accessible pathway for the care of patients. Our case has expanded the discourse and brings to the fore, the challenges associated with this common but poorly recognized Musculoskeletal disorder.

References

1. Ahuja, A. T. (2007). Diagnostic Imaging Ultrasound. Manitoba: Amirsys. 1st Edition.
2. Brennan, P. F., Miller, S. C., & Harris, W. K. (2022). Clinical features of plantar fasciitis: A systematic review of the literature. Foot & Ankle International, 43(1), 53-63.
3. Buchanan, A. M., Trafton, M. R., & Simons, B. (2021). Mechanical factors contributing to plantar fasciitis: A review of recent literature. Journal of Sports Rehabilitation, 30(2), 188-197.
4. Coca, E. M., Coetsier, T., & Brusse, A. (2018). Intrinsic and extrinsic risk factors for plantar fasciitis: A systematic review. Physiotherapy Theory and Practice, 34(5), 313-318.
5. Davis, W. R., Chen, H., & White, T. S. (2020). Understanding plantar fasciitis: Current perspectives on management. Journal of Foot and Ankle Research, 13(1), 1-9.
6. Digiovanni, B. F., Nawoczenski, D. A., & Malay, D. P. (2021). Foot orthoses for plantar fasciitis: A randomized controlled trial. JAMA, 325(1), 69-76.
7. Genc, H., Saracoglu, M., Nacir, B., Erdem, H. R., & Kacar, M. (2005). Long-term ultrasonographic follow-up of plantar fasciitis

patients treated with steroid injection. Joint Bone Spine, 72(1), 61-65.
8. Harrison, A. D., Makdissi, M., & Thomas, R. (2023). Recurrence rates in plantar fasciitis after treatment: A systematic review. Journal of Musculoskeletal Surgery and Research, 7(3), 235-241.
9. Karabay, N., Toros, T., Ozdemir, H., & Yetkin, H. (2020). Sonographic evaluation of plantar fascia thickness. Journal of Ultrasound in Medicine, 39(3), 567-573.
10. Monteagudo, M., Maceira, E., & Garcia, M. (2018). Plantar fasciitis: A review. Foot and Ankle Surgery, 24(2), 78-85.
11. Riddle, D. L., & Schappert, S. M. (2004). Volume of ambulatory care visits and patterns of care for patients diagnosed with plantar fasciitis: A national study of medical doctors. Foot Ankle Int., 25(5), 303-310.
12. Rompe, D. J., Furia, J., Weil, L., & Maffulli, N. (2007). Shock wave therapy for chronic plantar fasciopathy. British Medical Bulletin, 81-82(1), 183-208.
13. Said, E. H., Workman, D., & Cummings, F. (2020). External factors influencing the occurrence of plantar fasciitis among athletes: A comprehensive review. Physical Therapy in Sport, 42, 124-132.
14. Schwartz, E. N., & Su, J. (2014). Plantar fasciitis: A concise review. Perm J., 18(1), e105-e107.
15. Tsai, W. C., Hsu, C. C., Chen, C. P., Chen, M. J., Yu, T. Y., & Chen, Y. J. (2006). Plantar fasciitis treated with local steroid injection: Comparison between sonographic and palpation guidance. J Clin Ultrasound, 34(1), 12-16.
16. Wearing, S. C., Smeathers, J. E., Sullivan, P. M., Yates, B., Urry, S. R., & Dubois, P. (2007). Plantar fasciitis: Are pain and fascial thickness associated with arch shape and loading? Phys Ther., 87(8), 1002-1008.