Anthropometric, occupational profile and radiographic analysis of patients with plantar fasciitis

Perfil antropométrico, ocupacional e análise radiográfica de pacientes com fasciíte plantar

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ABSTRACT

Objective: To assess anthropometric, occupational profiles and radiographic analysis of patients with plantar fasciitis, and compare finding of our sample with data of the current literature. **Methods:** We included 99 patients treated in the foot and ankle surgery department at Nossa Senhora do Pari Hospital within ten months period. Participants were divided into three groups: pes planus, neutral feet, and pes cavus. Each group was assessed on the following parameters: age, body mass index, hours spent in standing position in daily activities, pes planus, pes cavus and presence of plantar calcaneal spur on radiographs. **Results:** Patients' mean age was 52.3 years, and 41.4% of them were classified as neutral feet, 43.4% as pes planus and 15.1% as pes cavus. A total of 73.7 % of patients were overweight with body mass index over 25 (mean of 28.07), the average time spent in standing position was 7.97 hours, and the plantar calcaneal spur was observed in 44.4 % of radiographs. No statistics difference among three groups was seen. **Conclusion:** All patients have one or more risk factors for plantar fasciitis. The results of our study were consistent with the current literature.

Keywords:
Fasciitis, plantar; Fasciitis, plantar/radiography; Body weights; Activities of daily living

RESUMO

Objetivo: Avaliar o perfil antropométrico, ocupacional e radiográfico dos pacientes com fasciíte plantar e estratificar a incidência dos fatores de risco para a doença, comparando os achados de nossa amostra aos dados da literatura atual. **Métodos:** Foram incluídos neste estudo 99 pacientes atendidos no ambulatório do Grupo de Cirurgia do Pé e Tornozelo do Hospital Nossa Senhora do Pari em um período de 10 meses, divididos em três grupos: pacientes com pés planos, neutros e pés cavos. Em cada grupo, os indivíduos foram avaliados quanto aos seguintes parâmetros: idade, índice de massa corporal, horas em ortostatismo nas atividades de vida diária e presença de esporão calcâneo plantar nas radiografias. **Resultados:** A idade média dos pacientes foi de 52,3 anos; 41,4% deles foram classificados como portadores de pés normais, 43,4% com pés planos e 15,1% com pés cavos; 73,7% apresentaram sobrepeso, com índice de massa corporal acima de 25 (média de 28,07), passavam longos períodos da vida diária, em média 7,97 horas em pé, e o esporão plantar esteve presente em 44,4% das radiografias, sem diferença estatística entre os grupos estudados. **Conclusão:** A totalidade dos pacientes estudados apresentou um ou mais dos fatores de risco pesquisados para o desenvolvimento da fasciíte plantar. Os resultados obtidos em nossa amostra estiveram em concordância com os dados da literatura.

Descritores:
Fasciíte plantar; Fasciíte plantar/radiografia; Peso corporal; Atividades cotidianas

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INTRODUCTION

Heel pain is a common complaint in orthopedic ambulatory and emergency services. The main cause of plantar hindfoot pain is still not fully understood. However, data in the literature indicate that repetitive weight bearing imposed on the fascia may injure its fibers and may trigger an inflammatory process. The process of cell repair is not complete because of an environment of repetitive microtraumas, which may lead to chronic inflammation and tissue degeneration.[1]

What contributes to the development of the disease in some individuals? Which anatomical characteristics indicate a high tendency toward plantar fasciitis? Some factors intrinsic to individuals and external agents are often seen in this group of patients. Intrinsic factors commonly mentioned are age, high body mass index, pes planus, pes cavus and restricted ankle dorsiflexion. Extrinsic factors include long periods of standing at work, inadequate shoes and high-impact physical activities, such as running.

We performed anthropometrical, occupational and radiographic analyses of individuals diagnosed with plantar fasciitis who were assisted at our service. Participants were stratified by risk factors.

METHODS

From January to October 2014, we assisted 137 patients reporting plantar hindfoot pain at an outpatient service of the ankle and foot surgery group at Hospital Nossa Senhora do Pari. Patients were seen by orthopedic residents under the supervision of an orthopedist, the preceptor. On the basis of a clinical complaint of plantar pain affecting the hindfoot, patients completed a questionnaire about characteristics of pain (type, intensity, duration, trigger factors and relief), professional activity, estimated time in orthostatic position during the day, age, sex, height and weight, in addition to radiographs of the front and profile of the affected feet.

Inclusion criteria were clinical history of intense pain upon taking the first steps after resting, in which improvement was felt after some steps but pain worsened after long periods of standing, and relief was obtained only after complete rest. Additional criteria were pain on palpation of plantar fascia in the medial calcaneal tubercle (Figure 1). Although complementary exams, such as ultrasonography and magnetic resonance imaging, are useful for the diagnosis, typical cases of plantar fasciitis are diagnosed precisely with adequate anamneses and physical exam. Patients with bilateral symptoms underwent radiography of both feet.

We excluded patients with asymmetry of foot position at physical examination in orthostatic position, pain limited to the central region of the hindfoot (which suggests a disease related to plantar pad), neurologic symptoms (which could suggest compression of lateral plantar nerve or syndrome of tarsal tunnel), and atypical symptoms. The sample included 99 patients diagnosed with plantar fasciitis, 80 of them women.

Patients were divided into three groups according to measurement of Moreau-Costa-Bertani angle on profile radiographs with feet weight bearing, as follows: normal feet with angles between 155º and 125º, pes cavus with angles less than 115º, and pes planus with angles greater than 125º (Figure 2). In each group, we evaluated age, body mass index (BMI), professional activity, time spent standing during the day and presence of plantar calcaneal spur on radiographs.

Data were analyzed with descriptive statistical calculation by using means and standard deviation for continuous data and analysis of frequency for dichotomous data. All estimated score were analyzed with calculation of 95%

Figure 1 | Palpation of plantar fascia.

Figure 2 | Moreau-Costa-Bertani angle.

confidence intervals (CIs). Continuous measures were compared by using a non-paired Student's t test, with a significance level was 0.05. Categorical variables were analyzed by chi-square test, with a significance level of 0.05.

RESULTS

Our study included 99 patients who fulfilled inclusion criteria. Participants' mean age was 52.3 years (±11.69). The mean body mass index (BMI) was 28.07 (±5.73), a value classified as overweight. Daily mean time that patients remained standing in domestic and work activities was 7.97 hours (±2.43). Plantar spur was identified radiographically in 44.4% of participants (95% CI, 35%-54%). For all cases clinically described as bilateral, radiographs of the feet showed the same characteristics. There was no case in which spur was identified in only one foot (i.e., it was observed in both feet or neither foot).

Based on the Moreau-Costa-Bertani angle, 15.1% (95% CI, 9%-24%) of patients were classified with pes cavus, 41.4% with normal feet (95% CI, 32%-51%) and 43.4% with pes planus (95% CI, 34%-53%). The remaining data on patients' characteristics according to the three classifications are shown in Table 1.

In the comparison of pes cavus, pes planus and normal feet, we found no statistical difference (significance level of 0.05) compared with age (p=0.7639), BMI (p=0.1553), number of hours standing (p=0.8298) or presence of plantar spur on radiographs (p=0.5795).

DISCUSSION

Plantar fasciitis or plantar aponeurosis originates in the medial process of calcaneal tuberosity. It is distally divided into three bands (lateral, central and medial) and has insertions in the medial, lateral and distal intermuscular septum in the hindfoot (plantar plates and base of proximal phalanx).

It has resistant and little elastic structure composed of dense conjunctive tissue. Its main function is to transmit power generated by contraction of the triceps surae up to the hindfoot during gait. In its secondary function, it acts as linking structure among three main points of foot support (calcaneus and the bases of the first and fifth metatarsus), supporting in formation and in maintenance of longitudinal and transverse plantar arches.[1]

Although the etiology of plantar fasciitis is probably multifactorial, it is believed that in most cases, chronic weight bearing of the fascia is a trigger and a factor in the maintenance of the condition. Intrinsic and extrinsic factors of individuals with fasciitis (age, body weight, type of feet, professional activity, duration of time standing during the day) contributed with weight bearing, causing continuous micro-injuries in fibers of the plantar fascia, which may lead to tissue degeneration and, consequently, thickness.[1]

Ultrasonography studies show that patients with unilateral plantar fasciitis present greater sagittal fascia thickness even in non-asymptomatic feet compared with a control group of normal individuals.[2,3] Riddle[4] reports that individuals with a BMI greater than 30 are at five times greater risk for plantar fasciitis than individuals with a BMI less than 25 and that patients who stand most of the day have a 3.5 times greater risk for developing the condition. In addition to increase in imposed weight bearing to fascia because of body weight, there is evidence that overweight individuals have reduced elasticity of the calcaneus plantar pad; this changes the biomechanical function of pad, contributing to overload of the plantar fascia.[5] In the studied population, 73.7% of patients were overweight.

Although data in the literature indicates a greater association of pes planus and occurrence of plantar fasciitis,[5] we did not find this relationships in our sample, in which 41.4% of patients had normal feet, 43.4% had pes planus and 15.1% had pes cavus.

Regarding orthostatism during daily life activities, there are no precise data in the literature related to the minimal hours of being standing as the risk-factor threshold. However, studies have reported that professional activities requiring long standing periods are considered risk factors

Table 1 | Characteristics of the sample

	Pes cavus (n=15)	Pes planus (n=43)	Normal feet (n=41)	Total (n=99)
Age	50.47 (±9.62)	52.35 (±11.85)	53.07 (±12.37)	52.36 (±11.69)
BMI	26.45 (±5.66)	29.22 (±6.65)	27.46 (±4.47)	28.07 (±5.73)
Number of hours standing	8.07 (±2.19)	7.91 (±2.55)	8 (±2.44)	7.97 (±2.43)
Spur on radiograph	33 (15-58)	49 (35-63)	44 (30-59)	44 (35 54)
Mesuared angle	111.32 (±1.76)	134.33 (±4.76)	121.05 (±2.51)	125.34 (±9.27)

Results shown as mean ± standard deviation or percentage (95% confidence interval). BMI: body mass index.

for the development of plantar fasciitis.[6] In our sample, patients worked or remained standing, on average, for 7.97 hours daily.

Plantar spur on radiographs as an isolated factor is not a diagnostic criteria for plantar fasciitis. However, a systematic review of the literature carried out in 2006 by Irwing et al.[7] concluded that overweight and presence of plantar spur are risk factors strongly associated with occurrence of plantar fasciitis. Other interesting data were published by Moroney et al,[1] who evaluated a sample of 1103 radiographs of patients assisted in their service; they reported that plantar spur was seen in 12.4% of patients. Patients with plantar spur and those without spur were divided into groups defined by sex and age. Although there was no conclusion concerning the direct association with plantar fasciitis, patients with spur reported high intensity of pain, and they were more likely to be overweight, had a four times higher chance of diabetes mellitus and a ten times greater chance of presenting osteoarthritis of the lower limbs. Our study identified plantar spur in 44% of radiographs, an incidence similar to data found in the literature. The assessment of each group (normal and flat feet) revealed that approximately 45% of cases had spur whereas only 33% pes cavus.

The incidence of plantar fasciitis is higher among patients aged 40 or older.[8,9] Our study findings agreed with this; the mean age of patients with spur was 52.3 years.

CONCLUSION

The anthropometrical and radiographic profile of patients with plantar fasciitis assisted at our institution revealed that at least one of the main risk factors for disease was seen in all cases. This finding corroborates with data published in the literature. Although plantar fasciitis is common, no published national studies evaluate the incidence of known risk factors in our population. Limitations of this study include the lack of differentiation between patients with acute and chronic plantar fasciitis, and lack of evaluation of an important clinical criterion, recently pointed out as a risk factor for the disease (i.e., gastrocnemius shortening).

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