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Plantar Fasciitis Risk Factors in Normal Population

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Conservative treatments results for plantar fasciitis patients are inconsistent and therefore manipulating risk factors could be the best option for this disease. to determine risk factors of plantar fasciitis. In a retrospective study, all patients who had plantar fasciitis were enrolled and were compared to control group on their demographic characteristics. The angle of dorsi-flexion was recorded by examination of orthopedic surgeon, history of pregnancy and time of standing in one day. Plantar curvature was measured by orthopedic surgeon. Female sex percentage was significantly higher in PF group than male sex (p=0.007), but the difference in sex was not significant between PF and control groups (p=0.22). Body mass index (BMI) above 30 was significantly higher in PF group compare to control group (p=0.013). Presence of bony spur was significantly higher in PF group compare to control group (p=0.03). There were significant differences in foot curve degree in patients between PF and control groups (p=0.037). Odds ratio (OR) of plantar fasciitis was 1.65 times in patients with bony spur. History of pregnancy increase OR of plantar fasciitis 1.37 times (OR:1.37; 95% CI:1.20-1.82, p=0.017). plantar fasciitis is associated with higher BMI, pregnancy, bony spur and foot curve cavus. However, it seems that a predisposing foot structural factor should also be accompanied with these risk factors.

Keywords: foot, Age-Related Problems, Plantar fasciitis, Heel, Rear foot, Ankle.

Plantar fasciitisis a common cause of heel pain in adults, that is usually described as stabbing or burning anteromedial heel pain that is worse in the mornings and after periods of rest. Plantar fasciitis is a localized inflammatory disorder of plantar aponeurosis. It is most common in middle aged to older adults with an estimated prevalence of 7% in adults over the age of 65. In adults under age 65, plantar fasciitis is more prevalent among individuals who are obese predominantly male, sedentary lifestyles, runners, military and those with occupations requiring prolonged standing[1]. Although life-time incidence of disease is estimated to be 10%; however, plantar fasciitis is estimated to account for more than 10% of all foot symptoms requiring interventions in adults. Literature review indicate that patients with known acute symptomatic plantar fasciitis can be treated with a variety of non-surgical modalities, and less than 5% of the affected individuals finally undergo surgery[2].

While unknown, the suggested pathogenesis of plantar fasciitis is repetitive micro-trauma and inflammation of the plantar fascia at the calcaneal insertion. Various risk factors have been offered for plantar fasciitis. Walking on

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hard surfaces or barefoot, inadequate stretching ,poor footwear, obesity, excessive foot pronation, excessive running, and prolonged standing are risk factors for developing plantar fasciitis[3,4]. Diagnosis is primarily based on history and physical examination. Patients may present with heel pain in their first steps in the morning or after prolonged sitting, and sharp pain with palpation of the medial plantar calcaneal region. Discomfort in the proximal plantar fascia can be elicited by passive ankle toe dorsiflexion. Diagnostic imaging is rarely needed for the initial diagnosis of plantar fasciitis. Conservative treatments results for plantar fasciitis patients are inconsistent [5]and therefore manipulating risk factors could be the best option for this disease.

Objective

The purpose of the present study was to determine whether risk factors for plantar fasciitis could be identified.

METHODS

Ethics Declaration

The study was reviewed and approved by the University of Medical Sciences Ethics Committee. All procedures performed in this study were in accordance with the ethical standards of the institutional research committee. Information about the study was given comprehensively both orally and in written form to all patients or their accompanying adult. They gave their informed written consents prior to their inclusion in the study.

Patient selection

In a retrospective case-control study, all patients who had plantar fasciitis were enrolled and were compare to control group on their specifications, demographic characteristics and other variables including age, sex, weight, BMI.

Other variables marked in patients' history were presence of bony spur on XR imaging. The angle of dorsi-flexion was recorded by examination of orthopedic surgeon. History of pregnancy was also asked and recorded in patients. Time of standing in one day was also asked from patient and was recorded. The plantar curvature was measured by orthopedic surgeon.

Statistical Analysis

Statistical calculations were conducted using SPSS 22 (Chicago, IL, USA). The parametric variables were presented as mean±SD and were analyzed by t-test or Mann-Whitney test; non-parametric variables were analyzed by Chi-Square or Fisher Exact test. $P<0.05$ was considered as statistically significant. Regression analysis was performed to detect risk factors for plantar fasciitis.

RESULTS

Number of 32 patients diagnosed with plantar fasciitis (PF) was enrolled and 32 control cases were also enrolled in the study. The summary of demographic variables is depicted in Table1.

Female sex was significantly higher in PF group than male sex (p=0.007), but the difference in sex was not significant between PF and control groups (p=0.22, Chi square).

Age was not significantly higher in PF group compare to control group (p=0.17).

Body mass index (BMI) above 30 was significantly higher in PF group compare to control group (p=0.013).

The side of involvement (left or right) was no significantly different in PF group compare to control group (p=0.406).

Presence of bony spur was significantly higher in PF group compare to control group (p=0.03).

History of underlying disease including diabetes, Hypertension, osteoarthrosis, and rheumatologic disorders was not significantly different between two groups (p=0.553).

There were no significant differences in dorsi-flexion angle between PF and control group (p=0.21).

Presence of gravidity history in patients of PF group was significantly higher compare to control group (p=0.007).

Number of patients who had standing above 5 hours in one day were not significantly higher in PF basis compare to control group (p=0.409).

Foot curve was compared between two groups. There were significant differences in patients who had flat foot or cavus between PF and control groups (p=0.037). However, there was no significant difference in cavus and flat foot in PF group.

In a regression analysis, it showed that age, standing more than 5 hours were not

Table 1. Demographic variables in plantar fasciitis and control groups

	PF (n=32)	Control (n=32)	p-value
Age	56.6±6.9	59.3±7.4	0.075
Sex			
Female	24	25	0.24
Male	8	7	
BMI	28.8±3.7	24.8±4.5	0.01

Table 2. Risk factors of plantar fasciitis

	Odds ratio (OR)	95% CI	p-value
Age	1.03	0.59-1.23	0.34
Female Sex	1.12	0.89-1.34	0.15
BMI>30	1.45	1.10-1.78	0.016
Bony spur	1.65	1.25-2.26	0.0024
Gravidity	1.37	1.20-1.82	0.017
Foot curve cavus	1.40	1.33-2.11	0.001

significantly a risk factor for plantar fasciitis. BMI, bony spur, gravidity, foot cuve were significant risk factors for plantar fasciitis. The data showed that odds ratio (OR) of plantar fasciitis was 1.45 times in patients with BMI>30 (Table2). Odds ratio (OR) of plantar fasciitis was 1.65 times in patients with bony spur (Table2). Presence of gravidity increase OR of plantar fasciitis 1.37 times (OR:1.37; 95% CI:1.20-1.82, p=0.017). Presence of cavus foot curve increase OR of to 1.37 (OR:1.37; 95% CI:1.33-2.11, p=0.001) (Table2).

CONCLUSION

The pathology and risk factors of plantar fasciitis is not well-known. Several publications have proposed various risk factors and controversy still remains.

Based on our results weight, higher BMI and history of gravidity are the risk factors for plantar fasciitis. Excessive weight could trigger the events eventually inducing PF. Weight bearing could prone patients to more pressure on bony and tendinous structures of foot. However, higher BMI and weight bearing should accompany a predisposition factor of stretched structures of foot. In a systematic review, increased weight in non athletic population, increased age, decreased ankle dorsiflexion, decreased first metatarsophalangeal joint extension and prolonged standing all demonstrated an association with plantar fasciitis[1].

Interestingly, height, weight and BMI in athletic population are not associated with plantar fasciitis. However, obesity and pronated foot posture are associated with plantar fasciitis and may be risk factors for the development in normal population. It is hypothesized that prolonged weight bearing and obesity together are risk factors for plantar fasciitis in adult non-athlete patients.

Gender preponderance is a matter of controversy in many publications. Our results showed that female sex was significantly higher in PF group than male sex, but the difference in sex was not significant between PF and control groups.

Unlike many publications, long-time standing was not a risk factor for PF in our study. This is in contrary to common belief that standing is a major risk factor for PF. It seems that long-standing could be a risk factor if it is associated with stiff structures of foot. Bolivar et al showed that plantar fasciitis is related to both hamstring and triceps surae tightness and stretching exercise of triceps surae and hamstrings should be recommended for treatment of plantar fasciitis, apart from an adequate tissue-specific plantar fascia-stretching protocol[2]. Besides, plantar fasciitis pain is associated with fascial thickening, and total real-time sonoelastographic score[3]. Plantar fasciitis may be associated with greater vertical ground reaction force load rates, lower medial longitudinal arch of the foot, and increased ankle dorsiflexion range of motion compared with the control group[4].

There were no significant differences in dorsi-flexion angle between PF and control group in our study. Previous reports also showed that decreased ankle dorsiflexion, calf endurance and occupational lower limb stress may not play a role in plantar fasciitis[5].

However, other researches in contrary to us depicted that tightness of the Achilles tendon will predispose to plantar fasciitis because limited dorsiflexion of the foot strains the plantar fascia[6]. The risk of plantar fasciitis increases as the range of ankle dorsiflexion decreases. Tightness of the

Achilles tendon (dorsiflexion at the ankle limited by 5% or more) is found in 78% of patients[7]. Individuals who spend the majority of their workday on their feet and those whose body-mass index is >30 kg/m^2 are also at increased risk for the development of plantar fasciitis. Reduced ankle dorsiflexion, obesity, and work-related weight-bearing appear to be independent risk factors for plantar fasciitis. Reduced ankle dorsiflexion appears to be the most important risk factor[8].

It is generally believed that PF is initiated by excessive tensile strain within the fascia during repetitive loading producing microscopic tears and an acute inflammatory response. Macrophages, lymphocytes, and plasma cells infiltrate the calcaneal enthesis causing tissue destruction. Tissue degeneration (fasciosis), rather than inflammation, then becomes the cardinal pathologic feature[9].

When compiling all results together, risk factors should accompany a predisposing structural factor. Plantar fascia thickening[10] and loss of normal tissue elasticity[11] play an important role in the genesis of persistent inferior heel pain. There is a fivefold increase in the mechanical stiffness of the plantar fascia in pathologic feet compared with healthy ones. This increased stiffness results in higher tissue hydrostatic pressure within the plantar tissues during loading, consequently acting on the external surface of blood vessels to reduce the flow cross-section area local blood supply[12]. Sconfienza et al showed that plantar fasciae of patients were less elastic than those of control subjects.

In conclusion, plantar fasciitis is associated with higher BMI, gravidity, bony spur and foot curve cavus. However, it seems that a predisposing foot structural factor should also be accompanied with these risk factors.

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