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High Prevalence of Obesity and Female Gender Among Patients With Concomitant Tibialis Posterior Tendonitis and Plantar Fasciitis.

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TITLE: **High Prevalence of Obesity and Female Gender Among Patients with Concomitant Tibialis Posterior Tendonitis and Plantar Fasciitis**

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1. Tibialis posterior tendonitis
2. Plantar fasciitis
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ABSTRACT:

The link between increased body weight and hindfoot complaints is largely based on correlation to single foot pathology. We sought to study obesity with respect to multiple foot pathology. We retrospectively reviewed 6,879 patients with tibialis posterior tendonitis (TPT) or plantar fasciitis (PF) or both. Among patients with either TPT or PF, 1 in 11 (9%) had both. The latter were neither statistically older nor more obese than patients with single diagnoses. However, they were statistically more female. Given the overall high prevalence of obesity in the study population, we feel this data supports the link between obesity and multiple foot pathology.

INTRODUCTION:

Common to all etiologies of acquired flatfoot deformity is mechanical failure of the medial longitudinal arch. Once the static stabilizers (i.e. capsuloligamentous structures) fail, secondary stabilizers such as the tibialis posterior tendon and plantar fascia may become strained and symptomatic.[1] A growing body of evidence indicates that the link between obesity and hindfoot pain is overload of these weight bearing structures.

Mechanical strain on the medial longitudinal arch is substantially increased in the setting of obesity. Compared to the feet of non-obese controls, obese patients' feet experience heightened plantar pressures.[2] Additionally, obese patients have been observed to have greater pronated foot posture. Irving et al. performed an age and gender matched case-control study of 160 patients with and without chronic plantar heel pain and found that patients with the disease were more likely to be obese and to have pronated foot posture.[3] Messier et al. compared obese to non-obese females and found that Q-angle and obesity correlated to increased hindfoot eversion. This group also had more abnormal foot angles.[4] It also appears that changes in foot structure do not reverse after weight loss.[2]

The development of hindfoot complaints has commonly been correlated to increased body weight. Frey et al. studied foot complaints among 580 females and found that plantar fasciitis (PF), tendonitis, and osteoarthritis were associated with being overweight.[5] Frey and Zamora reviewed the charts of 1411 foot and ankle surgery patients and found a significant correlation between being overweight and having tendonitis, including tibialis posterior tendonitis (TPT).[6] Holmes found a strong correlation between body mass index (BMI) and the incidence of tibialis posterior tendon rupture.[7] Rano and colleagues compared patients with heel pain to control subjects with other foot complaints and found that those with plantar fasciitis (PF) had higher BMI and were more sedentary.[8] Riddle et al. studied risk factors for PF and reported an odds ratio of 5.6 for BMI over 30 versus BMI less than 25, which they noted reflects the large effect size of BMI on the disease.[9] Later, Riddle et al. also found that elevated BMI was the only factor associated with the extent of patient-reported disability from PF.[10]

In light of these studies linking obesity to individual foot pathology, a link between obesity and multiple concomitant foot pathology is logical. Labib and colleagues reported that five percent of their patients with chronic heel pain (14 patients) had the triad of posterior tibial tendon dysfunction, PF, and tarsal tunnel syndrome. The authors suggested that this might be caused by strain of the involved structures due to progressively worsening pronated foot posture. The limited demographic and anthropometric data reported indicated that the majority of these patients were overweight but no comparison groups were studied.[11]

Prior to this study, the authors did not share a common perception of how frequently they encountered patients with both TPT and PF or if those patients were more obese than patients with only one of the diseases. Therefore, we designed this study for the purpose of comparing patients with coexisting TPT and PF to those with either diagnosis alone. Our objectives were to determine the prevalence of concomitant TPT and PF among patients with either disease and to evaluate the distributions of age, gender, and BMI among these groups. Based upon our review of the literature, we hypothesized that patients with coexisting TPT and PF would be much fewer in number but significantly more obese than patients with one disease alone.

METHODS:

This was an IRB-approved retrospective study of patients who visited a multispecialty orthopaedic surgical group with a foot and ankle division consisting of 4 fellowship-trained orthopaedic surgeons and 4 nonoperative podiatrists serving both urban and suburban populations between January 1, 2010 and June 30, 2013. An institutional database was queried for patients undergoing nonoperative management of the diagnoses of TPT (ICD-9 728.71) and PF (ICD-9 726.72). All 6879 patients who were identified were included in the statistical analysis. No patients were excluded.

Three comparison groups were established consisting of those patients with TPT alone, PF alone, or both diseases together. A descriptive, univariate analysis was made. A binomial theorem was utilized to determine the likelihood of a patient having both diseases given the presence of one or the other. Comparisons were made between groups using the two-tailed Student’s t-test for age and body mass index and Fisher's exact test for gender proportions. Statistical significance was established at p = <0.05.

RESULTS:

3315 patients (48.2%) had TPT alone, 3225 (46.9%) patients had PF alone, and 339 (4.9%) patients had both diseases. Demographic data is summarized in Table 1. The age and BMI distributions for each study group are depicted in Figures 1 and 2. With the numbers available for analysis, a patient with TPT had a 9.51% (95% CI 8.05% -10.98%) chance of having PF as well. Similarly, a patient with PF had a 9.28% (95% confidence interval 8.07-10.6%) chance of having TPT as well.

The distributions of BMI in all study groups were skewed toward the 25 or greater range. Patients with TPT alone and PF alone had relatively similar distributions within the CDC-designated overweight, obese, and morbid obesity categories. However, BMI among patients with both TPT and PF appeared to be even more skewed toward these categories. (Figure 2) The mean BMI for each group was above 30 but were all similar. (Table 1) Thus, there were no statistically significant differences in mean BMI between any two groups.

The age distributions of the three study groups had similar ranges and skew (Table 1, Figure 1), which resulted in similar mean age values. Nonetheless, small but statistically significant differences were found between the mean ages of patients with PF (52.2 years) versus the other two groups (TPT 54.4 years, p = <0.001 and Both diseases 54.0 years, p=0.021).

In all groups, females outnumbered males (Table 1) with the highest proportion of females occurring in the group with both diseases (74.1%). This percentage was significantly higher than in the groups with TPT alone (68.8%, p = 0.035) and PF alone (61.2%, p = <0.001).

DISCUSSION:

The purpose of this study was to determine the prevalence of coexisting TPT and PF among patients with either disease and to evaluate the distribution of BMI among these patients. Having found that one in eleven patients with one diagnosis also had the other, we chose to accept our hypothesis that patients with coexisting PT and TPT are far few in number than patients with either diagnosis alone in a foot and ankle practice.

The age, gender, and BMI distributions that we found for patients in the single diagnosis groups were consistent with previously reported data.[4-10,12-18] However, these distributions have not previously been reported among patients with coexisting TPT and PF.

Similar overall age and BMI distributions among all groups (Figures 1-3) resulted in very small differences in their mean values. (Table 1) There were no statistically significant differences in mean BMI between groups. Further, we judged that the statistically significant differences in mean ages between plantar fasciitis and the other groups were not clinically significant. Thus, we rejected our hypothesis of significantly more obesity among patients with coexisting TPT and PF.

Although the data indicates that patients with both diseases were neither older nor more obese than patients with single diagnoses, this study may have been underpowered with respect to BMI. Given the greater skew toward obesity among patients with both diseases and the overall high prevalence of obesity among all groups studied, we felt that our data still supports the logical link between obesity and multiple foot pathology.

Further investigation may be needed to explain the clinical significance of the female preponderance that we found among patients with both diseases. Indeed, it is well known that both TPT and PF affect females more commonly than males.[3,7.8,11,12,16] Yet, the reason for this is unclear. Although recent studies comparing men's and women's feet have identified gender-associated differences in skeletal structure, cartilage thickness and gait parameters,[19-23] the relative contributions to foot pathology made by intrinsic factors such as these and extrinsic factors like activity level, obesity and high heel shoe wear are not well understood.

The optimal management of the patient with coexisting TPT and PF is unclear. Management algorithms for TPT and PF do not address management of concomitant foot pathology.[24,25] For example, if one disease is more symptomatic, should it be the focus of initial treatment (i.e. short leg cast alone versus plantar fascia stretching alone) or should an attempt be made to treat both and how?

Our initial management of patients with both diseases includes 4 weeks of frequent plantar fascia-specific stretching and prevention of foot pronation using stirrup ankle brace (Air-Stirrup Ankle Brace, Aircast Incorporated, Summit NJ). Patients who achieve 50% or greater improvement in overall VAS continue with maintenance PF stretching and are prescribed custom orthotics with a rear foot post (addressing pronation), padded heel (shock absorption) and a scaphoid pad (medial arch support). For patients without 50% improvement in their VAS at 4 weeks, we institute rigid immobilization in a short leg cast. If symptoms persist, we obtain an MRI to rule out tears of TPT or PF and calcaneal stress reaction or fracture. Treatment at that point may be focused further as indicated.

In the case of chronic PF, patients are prescribed physical therapy following a course of immobilization. Should symptoms persist, consideration for operative management may be cautiously undertaken. In the case of TPT, should findings demonstrate advanced pathology with tendon tear or rupture, consideration may be given to bracing with a lace-up nonarticulating ankle foot orthosis or surgical intervention. However, while managing one condition surgically, conservative management of the other diagnosis continues when possible.

The present study had several important limitations. These include its retrospective nature and the inability to account for the effects of the many possible confounding variables (other demographic factors, comorbidities, duration of obesity, duration of disease, stage of disease, family history, prior trauma, level of activity, footwear choices, etc.) contributing to coexisting TPT and PF. Additionally, temporal relationships between the diseases could not be evaluated. For example, we did not review imaging studies of patients with TPT to rule out the absence of stage 2 or greater flatfoot deformity.

In summary, there exists a high prevalence of obesity among patients with TPT alone, PF alone, and both diseases concomitantly. This last group represented 1 in 11 patients among those with either disease and was more commonly female but was not statistically more obese than the comparison groups.

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Diagnosis group	Number (%)	Mean Age (Range)	Mean BMI	Female (%)	Male (%)
Tibialis posterior tendonitis	3225 (46.9)	54.4 (10-95)	30.5	68.8	31.2
Plantar fasciitis	3315 (48.2)	52.2 (10-96)	30.3	61.2	38.8
Both	339 (4.9)	54.0 (12-92)	31.1	74.3	25.7

Table 1: Demographic features of patients with tibialis posterior tendonitis, plantar fasciitis, and both diseases.

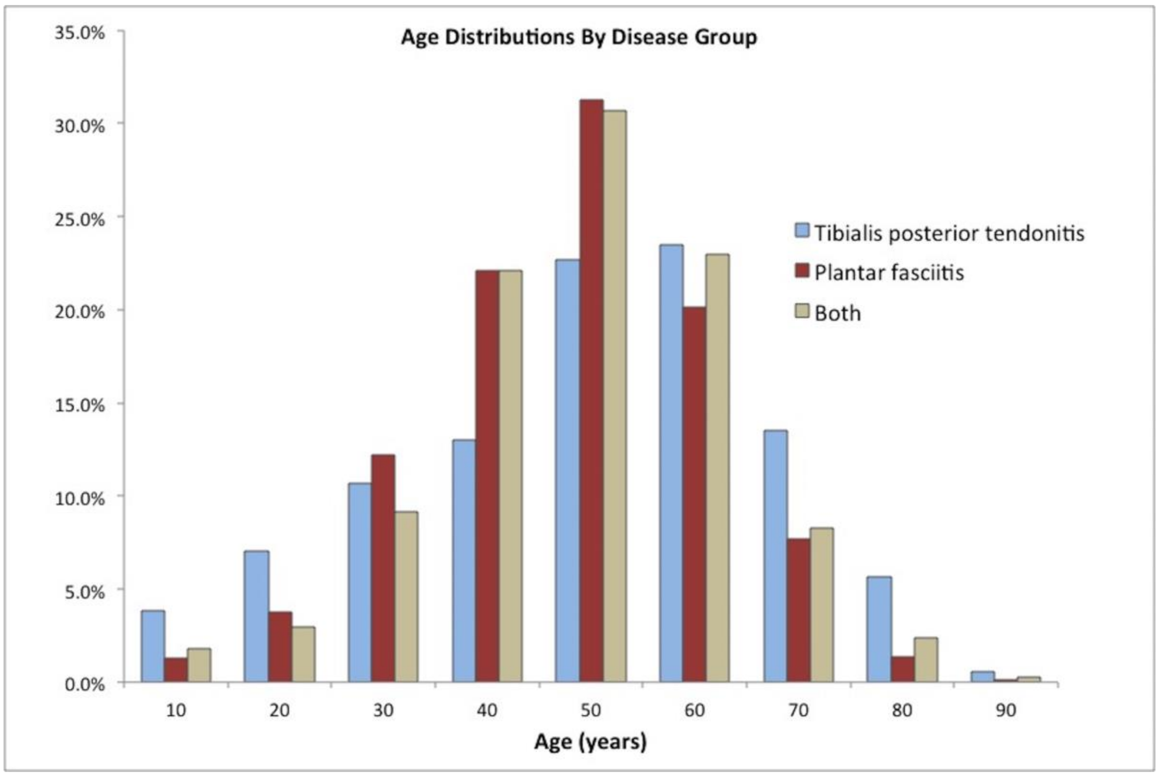

Figure 1: The distributions of age among patients with tibialis posterior tendonitis, plantar fasciitis, and both diseases.

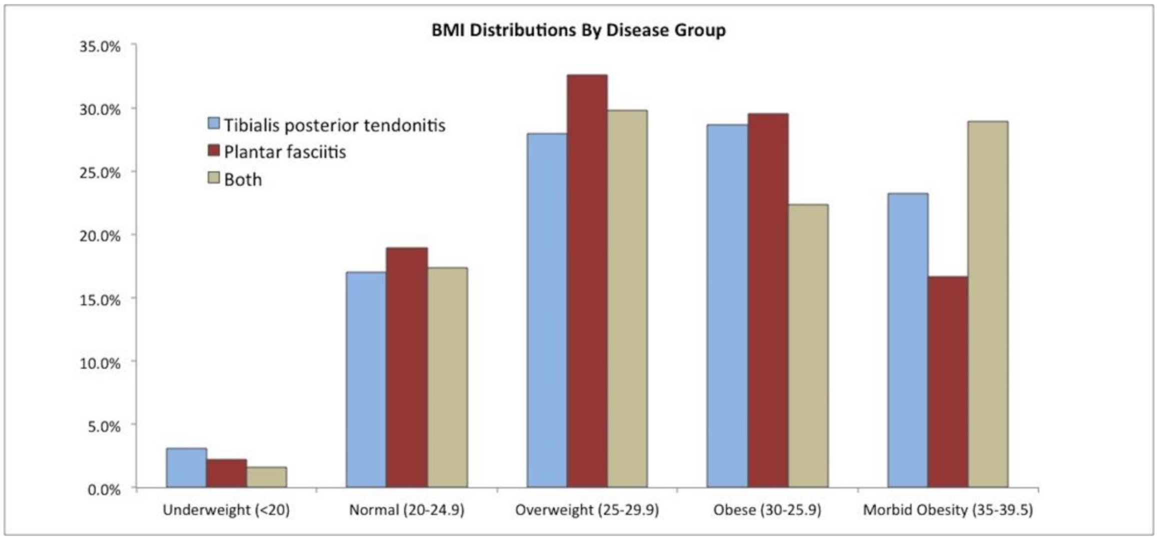

Figure 2: The distributions of body mass index among patients with tibialis posterior tendonitis, plantar fasciitis, and both diseases.