

## HEEL PAIN AND THE PLANTAR FAT PAD

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Heel pain in adults is usually attributable to biomechanically induced symptoms that are generally described by the term plantar fasciitis. The biomechanical fault has been closely aligned with a pronatory foot type that would yield excessive midstance pronation of the foot and a stretch or tensile pull of the plantar fascia at its origin on the calcaneal tubercles. The result is a localized inflammation or enthesopathy of the fascial and muscle insertions in the calcaneal tuberosity. Generally, the enthesopathy results in formation of the typical heel spur closely associated with the symptoms of heel spur syndrome or plantar fasciitis.

The object of the presentation is to review a large subset of adult patients who presented over a six-month period with a complaint of inferior heel pain that would typically be subscribed as heel spur syndrome or plantar fasciitis. This study looked at several parameters and attempted to document epidemiologic, clinical and radiographic characteristics of patients with plantar fasciitis.

Several parameters will be highlighted, particularly in regard to the plantar fat pad. The author has felt that the cushion or shock absorber function of the infracalcaneal fat pad was important, and that different types of patients would present with either pain in the medial heel and proximal plantar fascia or symptoms more directly inferior to the calcaneal tuberosity. In an effort to more closely look at these patients the following study was designed.

### METHODS

From January through June 2000, 234 adult patients with a major complaint of inferior heel pain were studied retrospectively. These patients were all treated by the same practitioner and all radiographs were interpreted by the same clinician. A form was completed on each patient as evaluation and treatment commenced.(Fig. 1)

It is generally assumed that most patients with plantar fasciitis are overweight and possess a pronated pedal architecture. These characteristics were reviewed, as well as height of the plantar fat pad on the standing lateral radiograph. Age, sex,

height and weight were recorded and BMI (body mass index) was calculated for each patient. Of the 234 patients, 88 (38%) were male and 147 (62%) were female. The patients ranged in age from 19 to 82 years with an average age of 47 years.

### RESULTS

BMI is a calculated value used to gauge obesity and total body fat. In 1998, the federal government announced guidelines to define a healthy weight and utilized BMI. A BMI of 25 or less is ideal, 25 to 29.9 is considered overweight and a BMI of 30 or above identifies obesity. In this study, the average BMI was 32, with an average patient weight of 205 pounds. Only 13% or 31 patients were considered not to be overweight. Most patients were moderately to severely obese with 75% of individuals having a BMI of 28 or greater.(Fig. 2)

A standing lateral radiograph was taken of each patient. A lateral medial projection was taken with the patient standing on quarter-inch thick piano felt so that the radiograph would allow visualization of the inferior skin margin. This allowed for accurate measurement of the height of the inferior plantar fat pad. The fat pad is generally believed to be important as a shock absorber particularly at heel strike, with the transmission of body weight from one extremity to the other. Structural specialization of fibrous septa and adipose tissue have been shown to impart the ability to resist compressive loads although the actual thickness of the fat pad is probably the most important factor in its role as the extremity's physiologic shock absorber.

Sarraffian suggests that the plantar fat pad begins to deteriorate after 40 years of age. In an effort to better define characteristics of the plantar fat pad, measurements of the plantar fat pad were taken. In all individuals, the average height of the inferior calcaneal fat pad measured 12 mm. (Fig. 3) It has also been suggested that elderly patients predominantly possess atrophy of the fat pad. Loss of the fat pad will increase loading of the calcaneal tuberosity and predispose the patient to painful



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Patient No. \_\_\_\_\_  
 Date \_\_\_\_\_

Age \_\_\_\_\_  
 Height \_\_\_\_\_  
 Weight \_\_\_\_\_  
 BMI \_\_\_\_\_  
 Occupation \_\_\_\_\_

Heel Pain Right \_\_\_\_\_ Left \_\_\_\_\_  
 Prior Episodes \_\_\_\_\_  
 Duration of Symptoms \_\_\_\_\_

When does it hurt? Right \_\_\_\_\_ Left \_\_\_\_\_  
 Morning Pain \_\_\_\_\_  
 Post-Static Dyskinesia at End of Day \_\_\_\_\_  
 > HRS of Standing/Walking \_\_\_\_\_  
 All the Time \_\_\_\_\_

Areas of Tenderness Right \_\_\_\_\_ Left \_\_\_\_\_  
 Medial Calcaneal Tuberosity \_\_\_\_\_  
 Calcaneal Tuberosity - Directly Inferior \_\_\_\_\_  
 Proximal Plantar Fascia \_\_\_\_\_  
 Arch/Plantar Fascia \_\_\_\_\_  
 Lateral Heel Pain \_\_\_\_\_  
 Medial Wall Calcaneus \_\_\_\_\_  
 Posterior Calcaneus \_\_\_\_\_

Ankle Dorsiflexion Right \_\_\_\_\_ Left \_\_\_\_\_  
 Fat Pad Atrophy \_\_\_\_\_  
 Paresthesia/Burning \_\_\_\_\_

Radiographic Examination Right \_\_\_\_\_ Left \_\_\_\_\_  
 Calcaneal Spur \_\_\_\_\_  
 Height of Fat Pad \_\_\_\_\_

Description of Spur  
 0 none, 1 early  
 2 moderate, 3 large  
 4 exuberant

Diagnosis Right \_\_\_\_\_ Left \_\_\_\_\_  
 Plantar Fasciitis \_\_\_\_\_  
 Inferior Calcaneal Bursitis \_\_\_\_\_  
 Calcaneal Enthesiopathy \_\_\_\_\_  
 Heel Pad Soft Tissue Atrophy \_\_\_\_\_  
 Calcaneal Stress Fracture \_\_\_\_\_  
 Achilles Enthesopathy \_\_\_\_\_

Treatment: Right \_\_\_\_\_ Left \_\_\_\_\_  
 Stretching Exercises \_\_\_\_\_  
 Home Shoe Program \_\_\_\_\_  
 PT; Contrast Baths \_\_\_\_\_  
 Padding/Strapping \_\_\_\_\_  
 Therapeutic Injection \_\_\_\_\_

NSAIDs  
 1 Celebrex  
 2 Vioxx  
 3 Voltaren  
 4 Cataflam  
 5 Naprosyn  
 6 Motrin

# \_\_\_\_\_  
 Rx: NASIDs \_\_\_\_\_  
 Physical Therapy \_\_\_\_\_  
 Multiple Density Insoles  Apex  NW Pod OD \_\_\_\_\_  
 Orthotic Devices \_\_\_\_\_  
 Heel Cup  Tulli  Silipos \_\_\_\_\_  
 Night Splint \_\_\_\_\_  
 TENS or PGS \_\_\_\_\_  
 Topical Ketoprofen \_\_\_\_\_  
 Rocker Shoes \_\_\_\_\_  
 Surgery \_\_\_\_\_

Figure 1. Patient Evaluation form

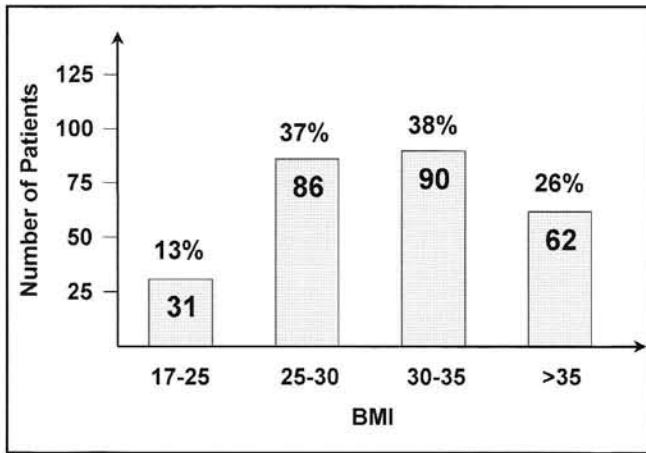


Figure 2. Results of BMI

stimuli. The average fat pad height in patients less than 40 years was 14 mm while in those over 40 was 11mm. If this is restricted to patients 65 years and older, the fat pad height decreases to 10 mm.

Certainly, there are treatment implications associated with the height of the fat pad. Steroid injections which are frequently given for inferior heel pain probably should be avoided in cases of overt fat pad atrophy. Corticosteroids are associated with catabolic changes and further fat atrophy. Elderly individuals with palpable subcutaneous

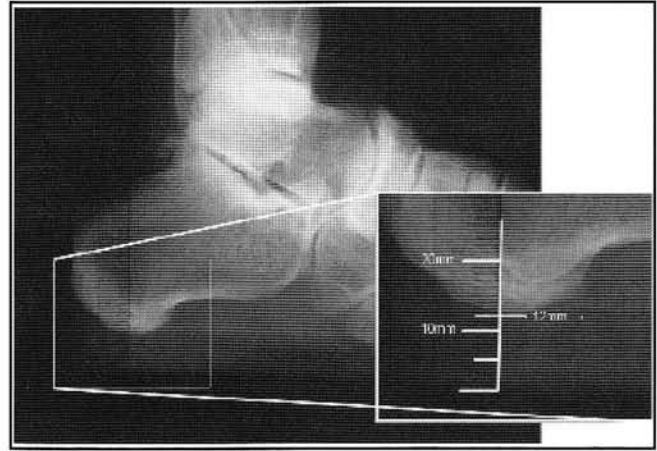


Figure 3. Standard weight-bearing lateral radiograph of the foot depicting a heel pad thickness of 12mm.

prominence of the calcaneal tuberosity should be treated with soft devices with particular regard to cupping and cushioning of the heel. These older patients and those excessively obese patients often flatten or thin the fat pad inferiorly with peripheral expansion. Intermittently, the fat pad may appear to be thickened and this likely represents an acute bursitis of the heel.