Association of Calcaneal Spurs with Above Average Body Weight

Jakob C. Thorud, DPM, MS[1,2], Tyler Jolley, DPM[1,2], Naohiro Shibuya, DPM, MS, FACFAS[1,2], Daniel C. Jupiter, PhD [1]

[1]Scott & White Memorial Hospital/Texas A&M Health Science Center, Temple, TX

[2]Central Texas VA Health Care System, Temple, TX

Texas A&M Health Science Center College of Medicine

Purpose

To determine whether there is an association between calcaneal plantar and posterior enthesophytes and above average body weight as defined by national averages of 75 kg in females and 90 kg in males.

Hypothesis

Above average body weight is associated with occurrence of enthesophytes.

Methodology

This was a secondary, cross-sectional analysis of data from our previously published research. The original study included patients with insertional Achilles tendinosis and matched controls from our podiatry clinic. Insertional Achilles tendinosis was diagnosed clinically with the presence of pain at the posterior or plantar aspect of the calcaneal tuberosity.

Inclusion Criteria

- Ages 18-80
- Weight bearing lateral X-ray
- Presented to S&W podiatry clinic from 2005-2012

Exclusion Criteria

- History of foot surgery, trauma to rearfoot, tear/rupture of Achilles tendon
- Non-ambulatory, or requiring ambulatory assistance devices
- Presence of Hagland's deformity
- Pain along Achilles tendon other than insertion

The control group was obtained from patients at the same clinic. The patients were categorized into two groups: "above" and "below" national average weight. The grouping was based on The National Health and Nutrition Examination Survey (NHANES) obtained from 19,593 survey participants. The study found the average weight of individuals greater than 20 years of age to be 74.7 kg in females and 88.3 kg in males (McDowell 2008). In this study, we used the cutoff of 75 kg in females and 90 kg in males to determine the odds-ratio in favor of calcaneal spurs in individuals with above average weight compared to individuals with below average weight, treated during the same time frame.

Procedures

Association of calcaneal enthesophytes with above average weight was analyzed using odds ratios and 95% confidence intervals. Plantar and posterior calcaneal enthesophytes were analyzed separately. Also, males and females were analyzed separately.

For each analysis, a 2x2 contingency table was created with the following variables: presence or absence of a plantar or posterior calcaneal spur versus above or below average weight (Table 1). When the confidence interval did not include 1, this was considered a significant association. The chi-square test of independence was also utilized to show statistical significance ($P < 0.05$). Stata/IC 10.0 (Stata Corp LP, College Station, TX) was used for all the statistical analyses.

Literature Review

Obesity has been associated with calcaneal spurs. One study (Menz 2008) found that subjects with calcaneal spurs were much more likely to have a BMI >30 (odds ratio of 6.9) as well as current or previous heel pain (OR = 3.9). In their study, the authors suggest that vertical compression rather than longitudinal traction causes spurs. Although obesity may be associated with diabetes, there is little evidence that calcaneal spurs are a complication of diabetes mellitus. (Tambalo 1995). Tambalo, et al. found that calcaneal spurs were associated with increased body mass index and age, while no such association was found with diabetes.

According to an MRI study, the plantar calcaneal spur is more often associated with the superficial layer of muscles than with the plantar fascia (Abreu 2003). Posterior calcaneal spurs, on the other hand, are found within the generally perceived pain causing structure, the Achilles tendon (Rufai 1995, Benjamin 2000). However, even if posterior calcaneal spurs are the result of traction, this may not be the etiology of pain with insertional Achilles tendinosis. Lyman et al. in a cadaveric study of posterior spurs found increased strain of the posterior aspect of the Achilles tendon, whereas the anterior portion is more commonly involved in insertional Achilles tendinosis (Lyman 2004). Interestingly, retrocalcaneal exostectomies are common practice when coupled with insertional Achilles tendinosis, while the removal of the plantar calcaneal spur has been largely abandoned with plantar fasciotomies (Tountas, 1996).

Identification of an association of weight and presence of spurs may provide insight to previous studies in which weight was associated with poor outcomes. Recognition of this association may provide a risk factor that may explain failures linked with increased body weight for surgical treatment of the Achilles tendon. Thus, it is important to confirm previous reports of this association.

Results

The results of the study are found in Tables 1 through 4. 103 females and 42 males were evaluated. Females with above average weight were significantly more likely to have plantar (OR = 5.45, 95% CI = 2.15–13.79) and posterior spurs (OR = 6.54, 95% CI = 2.66–16.10). Statistical significance for associations between male gender and presence of plantar spur (OR = 4.53, 95% CI = 0.83 – 24.76) or posterior spur (OR = 1.67, 95% CI = 0.40-6.97) was not detected.

	Plantar spur (+)	Plantar spur (-)	Total
Above average weight	42	26	68
Below average weight	8	27	35
Total	50	53	103

Table 1 – Female data, presence of plantar spurs vs. weight

	Posterior spur (+)	Posterior spur (-)	Total
Above average weight	51	17	68
Below average weight	11	24	35
Total	62	41	103

Table 2 – Female data, presence of posterior spurs vs. weight

	Plantar spur (+)	Plantar spur (-)	Total
Above average weight	17	15	32
Below average weight	2	8	10
Total	19	23	42

Table 3 – Male data, presence of plantar spurs vs. weight

	Posterior spur (+)	Posterior spur (-)	Total
Above average weight	20	12	32
Below average weight	5	5	10
Total	25	17	42

Table 4 – Male data, presence of posterior spurs vs. weight

Analysis and Discussion

Weaknesses of the study:

- Smaller sub-group of males as compared to females
- Sample from previously collected data which may not accurately represent clinical population
- Body mass index (versus weight) could have provided individual specific data to classify patients as obese or not obese.

Previous reports of radiofrequency coblation treatment of Achilles tendinosis have demonstrated unsatisfactory results in a predominately obese population (Shibuya et al. 2012). On the other hand, it was demonstrated in this study that individuals with above average weight are more likely to have calcaneal spurs. Thus, this minimally invasive technique for treatment of tendon pathology may not be ideal in the Achilles insertional area. Further clinical investigation is needed to evaluate the efficacy and safety of this technique in those with retrocalcaneal spurs.

Conclusion

In conclusion, in females, plantar and posterior calcaneal spurs were statistically significantly associated with above average body weight. This significance was not detected in the male population. This may be due to a relatively small sample size for the males, as evidenced by the large confidence intervals. As causes of spurs are unknown, the association of weight and spur formation supports theories including increased mechanical loads or systemic (increased bioactive peptides or altered metabolism) factors. Understanding factors that are associated with spurs may shed light on this topic, in turn changing clinical treatment. Further studies are needed to determine the role weight plays in the pathophysiology of calcaneal enthesophytes.

Figure 1- Spurs in a morbidly obese individual

References

Abreu MR, Chung CB, Mendes L, Mohana-Borges A, Trudell D, Resnick D. Plantar calcaneal enthesophytes: new observations regarding sites of origin based on radiographic, MR imaging, anatomic, and paleopathologic analysis. Skeletal Radiol. 2003 Jan;32(1):13-21. Epub 2002 Nov 22. PubMed PMID: 12525939.

Benjamin M, Toumi H, Ralphs JR, Bydder G, Best TM, Milz S. Where tendons and ligaments meet bone: attachment sites ('entheses') in relation to exercise and/or mechanical load. J Anat. 2006 Apr;208(4):471-90. Review. PubMed PMID: 16637873; PubMed Central PMCID: PMC2100202.

McDowell MA, Fryar CD, Ogden CL, Flegal KM. Anthropometric Reference Data for Children and Adults: United States, 2003–2006. National Health Statistics Report No. 10. National Center for Health Statistics. October 22, 2008.

Menz HB, Zammit GV, Landorf KB, Munteanu SE. Plantar calcaneal spurs in older people: longitudinal traction or vertical compression? J Foot Ankle Res. 2008 Aug 11;1(1):7. PubMed PMID: 18822162; PubMed Central PMCID: PMC2553779.

Rufai A, Ralphs JR, Benjamin M. Structure and histopathology of the insertional region of the human Achilles tendon. J Orthop Res. 1995 Jul;13(4):585-93. PubMed PMID: 7674075.

Shibuya N, Thorud JC, Humphers JM, Devall JM, Jupiter DC. Is percutaneous radiofrequency coblation for treatment of achilles tendinosis safe and effective? J Foot Ankle Surg. 2012 Nov;51(6):767-71. doi: 10.1053/j.jfas.2012.08.011. Epub 2012 Sep 11.

Tambalo, C, Poli, M, Mantovani, G, Bressan, F, Bambara, LM. Enthesopathies and Diabetes Mellitus. ClinExpRheumatol. 1995, Mar-Apr;13(2):161-6.

Tountas, A.A., Fornasier, V.L. Operative Treatment of Subcalcaneal Pain. ClinOrthop&Re Res. 1996, Nov; 332:170-8.