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Plantar calcaneal spurs and their connection with lumbar herniating disks

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ABSTRACT

Introduction: Calcaneal spurs are bony triangular projections of varying sizes that are found on the calcaneum. By analyzing the incidence of plantar spurs and lumbar herniated disks, the current research aims to provide a reliable baseline for determining the pathological significance of spurs with herniated disks.

Methods: Consecutive patients who had visited a local physiotherapy clinic for plantar calcaneal spurs between October 2022 and February 2023 with no self-reported comorbidities such as diabetes or vascular diseases were qualified for the study. Of the eligible subjects, a total of 84 patients were randomly selected from the clinic's database. All 84 patients were subjected to weight-bearing lateral foot radiographs and magnetic resonance imaging scans. A Visual Analog Scale (VAS) was used to measure heel pain. Associations between the presence of spurs, herniated disks, sex, body mass index (BMI), and heel pain were then explored.

Results: Of the 84 patients, 40 were males (48%) and 44 females (52%), with a mean age of 64.2 ± 5.6 years. The mean BMI was 28.5 ± 5.2 kg/m^2. From the analysis of the imaging examination results, of the 84 patients with calcaneal spurs, 40 (48%) had lumbar disk herniation at L5-S1, 38 (45%) at L4-L5, 1 (1%) high lumbar herniations, and 5 (6%) no hernia. Women accounted for 45% of L5-S1 herniations and 41% of L4-L5 herniations. Pearson correlation between the variables speaks for a positive weak ($r = 0.33$) and significant relationship between VAS and weight and between VAS and BMI ($r = 0.436$, $p < 0.001$).

Conclusion: Given the high percentage of patients suffering concomitantly from plantar calcaneal spurs and discal hernias (94%), we assume that there might be a probable link between the two disorders.

Keywords: Spurs; herniation; heel pain; Visual Analog Scale; elderly

INTRODUCTION

Calcaneal spurs are bony triangular projections of varying sizes that are found on the calcaneum. Based on location, calcaneal spurs can be classified as either dorsal or plantar, with the former occurring on the posterior surface of the calcaneum, and the latter on the plantar surface (1).

Different studies have attempted to classify plantar calcaneal spurs and determine their incidence to physiological factors (2-6). According to recent research, the incidence of plantar calcaneal spurs increases significantly with age (7). On the other hand, there is currently no agreed evidence linking calcaneal spurs to gender. A few studies show no gender differences in prevalence, while others with younger populations revealed an increased prevalence of the dorsal calcaneal spur in males and the plantar calcaneal spur in females (8-10). Attempts have also been made to establish a link between calcaneal spurs and pathological factors (Figure 1).

However, plantar calcaneal spurs are also seen in a considerable proportion of individuals in conjunction with lumbar disk herniation (LDH), a disorder caused by the compression of the spinal nerve root by protruding disk debris (11). So yet, there appears to be little investigation into the relationship between calcaneal spurs and LDH. As a result, the goal of our research is to look at a link between plantar calcaneal spurs and LDH. The current study aims to examine the prevalence of plantar spurs and discal herniation in patients to create valid baseline data for assessing the pathological importance of spurs to herniated disks.

METHODS

For our research, we collected data from patients who had attended a physiotherapy facility in the local area from October 2022 to February 2023 due to complaints of heel pain. Patients with self-reported major medical conditions such as diabetes or vascular diseases were excluded from the

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study. Of the remaining patients diagnosed with plantar calcaneal spurs, a total of 84 subjects were randomly selected from the clinic's database. Major medical conditions and the presence of heel pain were determined through a structured interview. Major medical conditions were reported using the question "Do you have/have you ever had the following conditions?" followed by a basic checklist of conditions. In terms of pain, subjects were asked, "Do you have/have you ever had the following symptoms?" while being presented with a checklist that included back pain, hip pain, knee/leg pain, and foot pain. Those who experienced foot discomfort were then asked to indicate the area of their pain on a schematic of the foot's dorsal, plantar, medial, and lateral pictures. Body mass index (BMI) was calculated as weight (in kilograms) divided by height (in meters), and obesity was defined as a BMI of >30 kg/m^2. The study was approved by the Ethical committee of Sports Univeristy of Tirana and written informed consent was obtained from all participants. To determine the presence of plantar calcaneal, patients were subjected to weight-bearing lateral foot radiographs and were evaluated for changes in the foot reflexes. Pain in the lumbar region and changes in the foot reflexes were pre-conditions for magnetic resonance imaging (MRI) scans to determine the presence of lumbar herniated disks. MRI results were analyzed to determine the distribution of herniated disks by sex and degree of herniation. Associations between the presence of spurs and sex, BMI, evaluation of the MRI for the lumbar part, self-reported co-morbidities, reflexes, and current or previous heel pain were then explored. To evaluate heel pain, a 100-mm Visual Analog Scale (VAS) was used (12,13). IBM Statistical Package for the Social Sciences Statistics 26.0 software was used to perform statistical analyses. Descriptive statistics, normality tests, and Pearson correlation techniques were used in this study.

RESULTS

Ultimately, 84 patients (40 males and 44 females) were eligible to be enrolled in our study. The mean age of the patients was 64.2 ± 5.6 years (range: 62–71 years old). Baseline characteristics of the patients are presented in Table 1. Based on the analysis of MRI results, 40 patients (48%) were diagnosed with LDH at L5-S1, 38 (45%) at L4-L5, 1 (1%) with high lumbar herniation, while in 5 patients (6%), no hernia was documented. At L5-S1, an equal prevalence of herniations for men and women was observed, while women account for 45% of the cases with L4-L5 herniations. The total distribution of disk herniations in percentage and by sex, age, and level of disk herniation is presented in (Figures 2-4).

The percentage of patients with calcaneal spurs diagnosed with LDH and impairment of ankle reflexes, paresis of dorsiflexion, and no impairment is presented in Table 2.

Descriptive statistic results (mean ± standard deviation) for the variables weight, height, BMI, and VAS by age and gender are depicted in Table 3.

Pearson correlation was used to analyze the relationship between the variables. Results speak for a positive weak (r = 0.33) and meaningful relationship between VAS and weight. A positive weak and significant relationship between VAS and BMI (r = 0.44, $p < 0.001$) is also observed. The detailed Pearson correlation results are presented in Table 4. Results of the VAS independent *t*-test (t (82) =1.85, $p = 0.69$) used to compare VAS scores between males and females showed a statistically non-significant difference ($p > 0.05$).

DISCUSSION

In this study, the prevalence of LDH in patients diagnosed with calcaneal spurs who were undergoing physical therapy due to their initial complaint of heel pain was evaluated. We found that a total of 79 patients (94%) diagnosed with heel spurs were also diagnosed with LDH.

"Heel spur" is a pathology characterized by lumbar discomfort and alterations in foot reflexes. This usually creates the pre-conditions for MRI examination of the lumbar region, as well as an evaluation of VAS and lower foot reflexes.

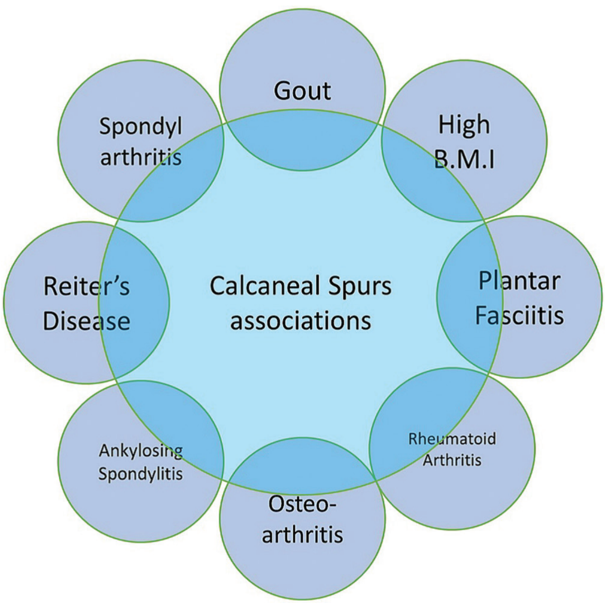

FIGURE 1. Associations of calcaneal spur. Note. From "Calcaneal spurs: A potentially debilitating disorder" (7).

TABLE 1. Demographic data of the patients

Age	No. subjects		Gender	
	Frequency	(%)	Men	Women
60–62	20	24	11	9
62–64	17	20	9	8
64–66	15	18	7	8
66–68	15	18	5	10
68–70	17	20	8	9
Total	84	100	40	44

TABLE 2. The incidence in the percentage of patients with calcaneal spurs and impaired ankle reflex, paresis of dorsiflexion, and without neurological signs

Diagnoses of foot reflexes in patients with calcaneal spurs	Discal hernias in percentage
Monosymptomatic impairment of ankle reflex	26
Monosymptomatic paresis of dorsiflexion	28
Concomitant impairment of ankle reflex and paresis	27
No paresis or impairment of reflexes	19
Total	100

TABLE 3. VAS, weight, height, and BMI distributions by age and gender

Gender	VAS	Weight (kg)	Height (cm)	BMI (kg/m^2)
Female				
Mean	6.1	79.3	167.1	28.4
n	44	44	44	44.0
Standard deviation	2.89	15.71	9.08	5.56
Male				
Mean	5.1	86.1	173.8	28.6
n	40	40	40	40.0
Standard deviation	1.1	13.6	9.1	4.8
Total				
Mean	5.6	82.5	170.3	28.5
n	84	84	84	84.0
Standard deviation	2.5	15.0	10.0	5.2

VAS: Visual Analog Scale, BMI: Body mass index

TABLE 4. Pearson correlation coefficients for weight, height, BMI, and VAS variables

Variables	Correlations			
	Weight (kg)	Height (cm)	BMI (kg/m^2)	VAS
Weight (kg)				
Pearson correlation	1	0.35**	0.80**	0.33**
Sig. (2-tailed)		0.00	0.00	0.00
n	84	84	84	84
Height (cm)				
Pearson correlation	0.35**	1	−0.27*	−0.11
Sig. (2-tailed)	0.00		0.01	0.34
n	84	84	84	84
BMI (kg/m^2)				
Pearson correlation	0.80**	−0.27*	1	0.44**
Sig. (2-tailed)	0.00	0.01		0.00
n	84	84	84	84
VAS				
Pearson Correlation	0.33**	−0.11	0.44**	1
Sig. (2-tailed)	0.00	0.34	0.00	
n	84	84	84	84

VAS: Visual Analog Scale, BMI: Body mass index
*significance (p-value) lower than 0.05; **significance (p-value) lower than 0.01

There is a lot of evidence that herniated disks cause variations in walking speed. Patients with low back pain (LBP) frequently report difficulty walking and moving slower than their healthy counterparts (14,15). Furthermore, these individuals' gait coordination is altered. Horizontal rotations of the pelvis and thorax are synchronous ("in-phase") during typical slow walking, but they move more "out-of-phase" (less synchronous) at greater speeds. In individuals with persistent non-specific LBP, this decrease in coordination at higher speeds happens less often (16). The same thing has been said about pregnancy-related pelvic girdle pain (17,18). Hence, there is a possibility that the early onset of a discal hernia causes changes in walking pace in patients, as seen in the form of calcaneal spurs in the lower foot or plantar fasciitis, and other pathologies were previously thought to be stand-alone pathologies but are caused by other causes (lumbar discal hernia). Therefore, calcaneal spurs and LDH may be viewed as linked pathologies and as part of a negative circuit based on discal hernias, body weight changes, and changes in walking patterns.

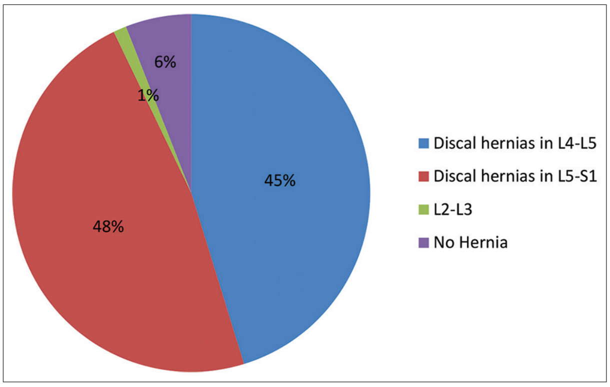

FIGURE 2. Percentage of discal herniations stratified by disk level.

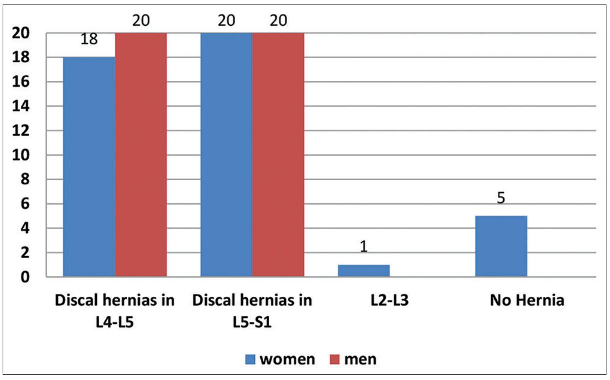

FIGURE 3. Distribution of discal hernias incidence according to disk level and gender.

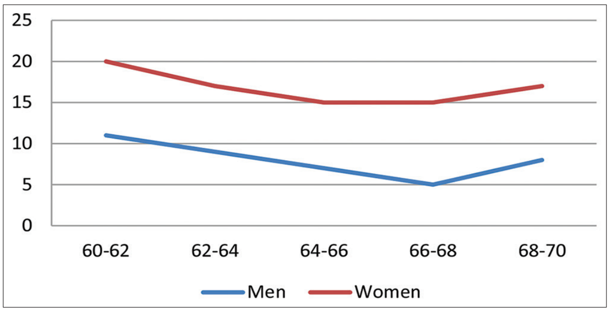

FIGURE 4. Age distribution of patients with lumbar disk herniation.

This idea comes in line with Saffan et al. (19) who found that individuals with painful calcaneal spur had a greater prevalence of lumbar pathologies, which is also supported by the explanation put forward by Richie who maintains that LBP dysfunction may lead to neuromuscular deficit creating strength deficits in the intrinsic or extrinsic muscles of the foot. This in turn can make overload and asymptomatic thickening of an otherwise healthy plantar aponeurosis (20).

These findings need to be interpreted in light of several limitations in the study design. First, the sample size is small; therefore, the association between calcaneal spurs and LDH revealed here which may not be generalizable to the larger community. Second, self-report was used to identify the existence of major medical conditions. Although self-reported medical history in older persons has been found to be accurate for most illnesses, women tend to over-report while males tend to under-report (21). Third, heel pain was noted as present or absent, with no attempt made to pinpoint the source of the pain. As a result, it is probable that cases of heel pain with a non-mechanical cause were included. Finally, as with all cross-sectional studies, collected data cannot be used to establish causal links. While the connections reported here are biologically feasible, more study is needed to establish causation.

CONCLUSION

By analysis of the imaging results, researchers found a high prevalence of LDH (94%) in patients diagnosed with calcaneal spurs. The findings of the study might speak for a possible association between the incidence of LDHs and plantar calcaneal spurs. However, taking into consideration the limitations of the study, further research with additional patients is needed to confirm the validity of this link.

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DECLARATION OF INTEREST

Authors declare no conflict of interests.

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