

TO DETERMINE THE RADIOLOGICAL ASSESSMENT OF HEEL PAIN AND CALCANEAL ENTHESOPHYTES

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Abstract

Background: Heel discomfort is a prevalent issue related to the musculoskeletal system that has a substantial impact on everyday activities and overall quality of life. Calcaneal enthesophytes, often known as heel spurs, are a significant radiographic finding in cases with heel discomfort. These osseous protuberances near the calcaneal insertion of the plantar fascia or Achilles tendon are often seen in individuals with persistent heel pain, but their precise contribution to the development of pain is still a matter of contention. The aim is to determine the radiological assessment of heel pain and calcaneal enthesophytes. **Materials and Methods:** This research was undertaken at the Department of Anatomy as a cross-sectional observational study. Ankle joint lateral radiographs of 180 patients (100 males and 80 females) who visited the orthopedics OPD with symptoms of heel discomfort were independently examined. Additionally, the patients' age and sex were included into the analysis. The research included patients who reported persistent heel pain for a minimum of three months and were between the ages of 23 and 80. All X-rays were assessed by a seasoned radiologist. We evaluated the presence or absence of plantar, dorsal (Achilles), or both spurs. **Result:** The research comprised a total of 180 participants, consisting of 100 men and 80 females, who were experiencing heel discomfort. Among these participants, 159 individuals (88.33%) had some kind of calcaneal spur. Specifically, there were 90 males and 69 females with calcaneal spurs. Spur was absent in 21 individuals, comprising of 10 males and 11 females, which accounts for 11.67% of the total. A plantar spur was seen in a total of 106 individuals, consisting of 48 men and 58 females. The highest prevalence of plantar spur (48.11%) was found in the age range of 50-60. Given its prevalence in terms of gender, it was more often seen in females (54.72%) compared to men (45.28%). The prevalence of this condition was higher in men (61.11 percent) compared to females (38.89 percent). **Conclusion:** The incidence of calcaneal spur accompanied by heel discomfort was 88.33%. Regular exercise, lifestyle change, and choosing appropriate footwear should be included into one's routine to address the degenerative process that causes the growth of a calcaneal spur, a prevalent cause of heel discomfort.

INTRODUCTION

Heel pain is a common problem that affects a large number of people, causing severe discomfort and difficulty in performing daily activities. Calcaneal enthesophytes, sometimes referred to as heel spurs, are a frequent cause of heel discomfort.^[1] These osseous protuberances, often seen at the point where the plantar fascia attaches to the calcaneus, are often seen in persons suffering from chronic plantar

fasciitis, but they may also develop in people without any symptoms. Radiological examinations are often used to diagnose calcaneal enthesophytes, and they are considered the most reliable method for this purpose.^[2] Radiographs may provide precise information on the dimensions, configuration, and precise positioning of these osseous protrusions, offering crucial insights into their probable involvement in heel pain. Although the precise pathophysiology of calcaneal enthesophytes is not

fully understood, they are thought to develop as a result of prolonged pulling of the plantar fascia or Achilles tendon, causing inflammation and eventual calcification at the sites where they attach.^[3] Calcaneal spurs may be classified into two types: dorsal, posterior, or Achilles spurs, and plantar or inferior spurs. They have the potential to induce severe heel pain or stay without symptoms. These variances probably indicate variations in the normal growth of the calcaneus. It might happen as a result of ongoing injury to the back or bottom part of the heel bone. Factors such as obesity, flat feet (pes planus), and high-arched feet (pes cavus) might speed up the development of the disease. Neovascularization and ossification may cause the development of a calcaneal spur as a result of scar tissue production.^[4] Recent investigations have shown that the prevalence of calcaneal spur in individuals with plantar heel pain ranges from 75.9% to 89%.^[5] Calcaneal enthesophytes are a prevalent etiology of heel discomfort. Understanding the origin of this infamous spur is intriguing. The foot muscles and ligaments experience straining due to abnormal stresses, which may gradually result in the development of calcaneal spurs. This may cause irritation to adjacent muscles and soft tissues, leading to discomfort, inflammation, and impaired mobility.^[6-9] The correlation between heel discomfort and calcaneal enthesophytes has been well researched. Nevertheless, there is ongoing discussion in the scientific literature over whether these bony outgrowths are the direct source of heel pain or just an unrelated discovery. Several studies indicate that heel spurs are a subsequent reaction to plantar fasciitis, and the discomfort is caused by the inflammation of the plantar fascia rather than the spur itself.

MATERIALS AND METHODS

This research was undertaken at the Department of Anatomy as a cross-sectional observational study. The study received approval from the institutional ethics committee. Enrollment of participants in the research was contingent upon getting their informed permission for the collection and use of their data. Ankle joint lateral radiographs of 180 patients (100 males and 80 females) who visited the orthopedics OPD with symptoms of heel discomfort were independently examined. Additionally, the patients' age and sex were included into the analysis. The research included patients who reported persistent heel pain for a minimum of three months and were between the ages of 23 and 80. All X-rays were assessed by a seasoned radiologist. The patients were classified into six age groups: below 30, 30-40, 40-50, 50-60, 60-70, and over 70 years. We evaluated the presence or absence of plantar, dorsal (Achilles), or both spurs. The research excluded patients having a prior history of any bone fracture involving the ankle joint, any foot surgery, inflammatory joint

disorders, tendonitis, and congenital or acquired foot abnormalities.

Statistical analysis included doing Fisher's exact test and chi-square tests to compare various variables. The significance of the results was determined using a p-value threshold of less than 0.05. The data were subjected to statistical analysis using the Statistical Package for Social Sciences (SPSS) version 25. Subsequently, deductions and explanations were derived from the scrutinized data.

RESULTS

The research comprised a total of 180 participants, consisting of 100 men and 80 females, who were experiencing heel discomfort. Among these participants, 159 individuals (88.33%) had some kind of calcaneal spur. Specifically, there were 90 males and 69 females with calcaneal spurs. Spur was absent in 21 individuals, comprising of 10 males and 11 females, which accounts for 11.67% of the total. The age group of 50-60 years had the highest number of respondents (n=91) experiencing heel discomfort, regardless of gender. An abundance of spur was also seen in the age range of 50-60 years in both males and females (n=86, 47.78%). Among the participants, 90 men (50%) had a higher likelihood of having a spur, whereas 69 females (38.33%) had heel discomfort [Table 1]. None of the participants in the age bracket of 30-40 years had heel discomfort, which was a significant observation. Statistical analysis using Fisher's exact test revealed a very significant p-value of less than 0.0001 for both male and female individuals who had heel discomfort with a spur. A plantar spur was seen in a total of 106 individuals, consisting of 48 men and 58 females. The highest prevalence of plantar spur (48.11%) was found in the age range of 50-60. Given its prevalence in terms of gender, it was more often seen in females (54.72%) compared to men (45.28%). The chi-square test was used to compare categorical data, as shown in [Table 2]. A p-value less than 0.05 indicates statistical significance. There was a notable rise in plantar spur till the age of 60 (p=0.04). The presence of the dorsal spur was noted in a total of 18 people, consisting of 11 males and 7 females. It was found to be most common (55.56 percent) among adults aged 50 to 60. The prevalence of this condition was higher in men (61.11 percent) compared to females (38.89 percent). Fisher's exact test was used for the statistical analysis, as shown in [Table 3]. A p-value below 0.05 was deemed to have statistical significance. A significant rise in dorsal spur was seen till the age of 60 (p=0.02). A total of 35 participants (27 men and 8 females) were found to have both plantar and dorsal spurs. The greatest prevalence of these spurs (60%) was seen in the age range of 50-60 years. The prevalence of the condition was higher in men (78.57%) than in females (21.43%). The statistical analysis was conducted using Fisher's exact test, as shown in [Table 4]. A p-value below 0.05 was deemed statistically significant. There was a notable

rise in the occurrence of both plantar and dorsal spurs until the age of sixty years ($p=0.01$), after which it decreased.

Table 1: Heel pain having the presence or absence of calcaneal spur.

Age in years	No. of males with heel pain=100		No. of females with heel pain=80		Total subjects with heel pain =180	Total subjects with calcaneal spur =159	Percentage
	Presence of calcaneal spur	Absence of calcaneal spur	Presence of calcaneal spur	Absence of calcaneal spur			
Below 30	2	6	2	6	16	4	2.22
30-40	0	0	0	0	0	0	0
40-50	10	2	17	0	29	27	15
50-60	54	0	32	5	91	86	47.78
60-70	19	0	18	0	37	37	20.55
Above 70	5	2	0	0	7	5	2.78
Total	90 (50%)	10 (5.56%)	69 (38.33%)	11 (6.11%)	180 (100%)	159	88.33

Table 2: Association of the plantar spur with different age groups and gender in subjects with heel pain

	Plantar Spur			Total Number	Percentage	P=0.04
	Male	Female				
Below 30	3	0		3	2.83	
30-40	0	0		0	0	
40-50	9	11		20	18.87	
50-60	25	26		51	48.11	
60-70	11	15		26	24.53	
Above 70	0	6		6	5.66	
Total	48 (45.28%)	58 (54.72%)		106	100	

Table 3: Association of the dorsal spur with different age groups and gender in subjects with heel pain.

Age Group (years)	Dorsal Spur			Total Number	Percentage	p-value
	Male	Female				
Below 30	0	0		0	0	p=0.02
30-40	0	0		0	0	
40-50	0	0		0	0	
50-60	8	2		10	55.56	
60-70	3	5		8	44.44	
Above 70	0	0		0	0	
Total	11 (61.11%)	7 (38.89%)		18	100	

Table 4: Association of both plantar and dorsal spur with different age groups and gender in subjects with heel pain.

Age group (in years)	Both Plantar and Dorsal spur				P value
	Male	Female	Number	Percentage	
Below 30	2	0	2	5.71	0.01
30-40	0	0	0	0	
40-50	0	5	5	14.28	
50-60	18	3	21	60	
60-70	4	0	4	11.42	
Above 70	3	0	3	5.71	
Total	27 (78.57%)	8 (21.43%)	35	100	

DISCUSSION

Calcaneal spurs in the Achilles tendon and plantar fascia are well acknowledged, however the relationship between these spurs and age and gender is still unclear. Our research findings demonstrate that the occurrence of plantar and dorsal spurs differs according to age and gender. It is important to note that this research is the first to demonstrate the correlation between calcaneal spurs and age and sex in patients with heel pain in the North Indian population. The etiology of plantar spurs is a subject of ongoing discussion. Bergmann explained that the condition is produced by the repeated pulling of the plantar fascia as it attaches to the heel bone, leading to inflammation and the formation of new bone at the

attachment site.^[10,11] According to Kumai and Benjamin, plantar spurs are caused by vertical compression and cannot be traction spurs since they do not form into the plantar fascia itself.^[12] Consequently, Achilles tendon spurs are fundamentally different from the ones that occur as a consequence of degenerative changes in the plantar fascia entheses. This description aligns with previous studies that suggests the bone trabeculae of plantar spurs are vertically oriented. This indicates that the forces that contribute to spur formation may come from vertical loading. Furthermore, Weiss provided evidence that dorsal spurs are partly caused by extended periods of physical exertion, whereas plantar spurs are a consequence of prolonged standing and being overweight.^[13,14]

The research conducted by Williams et al.^[15] found that 75% of individuals have heel discomfort due to the presence of calcaneal enthesophytes, often known as spurs. Prichasuk and Subhadrabandhu found that calcaneal spur was present in 15.5% of the normal population (n = 400) and in 65.9% of patients with plantar heel pain (n = 82). This led them to infer that calcaneal spur is a contributing factor to heel pain.^[16] Spurs of any kind were found in 88.33 percent of individuals experiencing heel pain, a rate that is similar to prior studies. Nevertheless, Lourdes and Ram discovered that 59 percent of South Indians in the community who had heel soreness had a calcaneal spur.^[17]

The current research found that the highest frequency of calcaneal spurs (n=86, 47.78%) was seen in the age range of 50-60 years. The results presented here closely aligns with Bassiouni's findings, which revealed a notable correlation between age and the occurrence of calcaneal spurs in patients with osteoarthritis and rheumatoid arthritis. Specifically, the greatest prevalence of calcaneal spurs was seen in the 40-60 year age group, when compared to a control group of healthy individuals.^[18]

The current research is consistent with the findings of Banadda et al., who reported a 50% prevalence of calcaneal spurs in Zimbabwean hospital patients aged 51 years and older.^[19]

Weiss also observed a positive correlation between age and the frequency of spurs.^[14] Beytemür and Oncü discovered that the prevalence of plantar calcaneal spur increased with age among the Turkish population, but there was no association with gender or location. The incidence rate was greatest at 41.8 percent among those aged 70 and above. It was shown that the occurrence of posterior calcaneal spur increased with age and was more common in females, but there was no correlation with the location. The greatest incidence was seen at 22.3 percent among those aged 61 to 70.^[20]

However, our research found that the largest occurrence was seen among those aged 50-60, while it was much lower among those above the age of 70. The variation in prevalence rates may be attributed to differences in populations. In India, normal employment often include prolonged periods of standing and continuous activities, which require time to cause the development of spurs. As a result, these spurs are most often seen in this age group. Toumi et al.^[21] shown that the occurrence of spurs reached its highest point at 22 percent among individuals aged 60-69 years, but thereafter declined. However, we observed that the highest occurrence was seen among those aged 50-60 years, and thereafter declines.

The research showed that individuals aged 20 to 30 with heel pain had a relatively low occurrence of calcaneal spurs. This suggests that the creation of spurs is a result of a degenerative process that leads to the development of bone growth known as osteophytes. The scarcity of spurs in age groups

under 30 years indicates that it takes a significant amount of time for spurs to form.^[22]

Another plausible reason is that the formation of these spurs is not largely caused by mechanical strain related to physical activity, despite the fact that this age group is the most physically active.^[23,24]

Irving et al. conducted a thorough examination to investigate variables associated with persistent plantar heel pain. The researchers examined 16 published studies and determined that increased weight and older age were linked to experiencing pain in the heel of the foot among individuals who are not athletes.^[25] Toumi et al.^[21] found that there is a significant association between the presence of calcaneal enthesophytes (spurs in the Achilles tendon and plantar fascia) and gender. Their study revealed that women had a higher prevalence of these spurs compared to males, particularly in individuals aged 50 years and older. Lourdes and Ram observed a higher proportion of females (60%) compared to men in the South Indian population.^[17] Beytemür and Oncü demonstrated a higher prevalence of the posterior (dorsal) calcaneal spur in females. Nevertheless, there was no discernible disparity in the occurrence rate of the plantar calcaneal spur between men and females.^[20] However, the current study found that men (50%) were more prone to have a spur presence compared to females (38.33%). In India, this disparity may arise from the occupation-related factors such as extended standing and physically demanding tasks often undertaken by men as part of their regular work. Plantar spurs were more prevalent than dorsal spurs in both men and females, when considering the different forms of spurs. Multiple studies have shown that females have a greater occurrence of plantar calcaneal spurs.^[19] Our research aligns with existing studies, since we found a greater occurrence of plantar spur in females (54.72%). Nevertheless, several research suggest that there are no disparities between genders.^[21]

Calcaneal spur may be linked with several systemic conditions, notably inflammatory diseases such as rheumatoid arthritis, diffuse idiopathic skeletal hyperostosis, ankylosing spondylitis, Reiter syndrome, acromegaly, and psoriatic arthritis. Furthermore, variables such as obesity, advanced age, pes planus (flat feet), occupations that involve prolonged standing, and participation in sports increase the chance of developing calcaneal spurs.²⁶ It is worth noting that calcaneal spurs are often seen on both feet in individuals with these characteristics. However, unilateral spurs are often seen in the majority of instances with heel discomfort.

CONCLUSION

The incidence of calcaneal spur accompanied by heel discomfort was 88.33%. Regular exercise, lifestyle change, and choosing appropriate footwear should be included into one's routine to address the

degenerative process that causes the growth of a calcaneal spur, a prevalent cause of heel discomfort.

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