

# An observational study of calcaneal enthesophytes (spurs) related to heel pain

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## Abstract

**Background:** Calcaneal spurs are more common in those who have decreased elasticity of the plantar heel fat pad that occurs in older people, females, overweight or obese, in diabetes mellitus and osteoarthritis. These factors combine to create a pathologic overload and micro tears in the fascia at the calcaneal insertion. Tears lead to inflammation where subsequently calcium gets deposited and spur develops. Present study was undertaken to assess the incidence of heel pain related to calcaneal spurs at a tertiary hospital. **Material and Methods:** Present study was a prospective, observational study done in department of orthopedics in patients, above 18 years, persistent heel pain at least for three months and pain score as per Wong-Bakers criteria more than 4, willing to participate and follow up. **Results:** Total 100 patients were studied during study period. Most common age group was 41-60 years (65 %) with mean age as  $51.5 \pm 9.4$  years. Female (62%) predominance was noted. 29 % patients had BMI above normal (more than  $25 \text{ kg/m}^2$ ). Common associated conditions were Diabetes (12 %), osteoarthritis (11%). Calcaneal spur was noted in 41% cases (22% had in right heel while 19% had in left heel). Achilles (25%) and plantar (16%) spurs were noted. **Conclusion:** Presence of calcaneal spurs might be an indicator of foot pain, spurs themselves do not cause the pain but might be indicators of associated conditions. Spur formation to be part of a degenerative process resulting in osteophyte formation appearing in the form of bony growth.

**Keywords:** calcaneal enthesophytes, calcaneal spurs, heel pain, Achilles spur

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## INTRODUCTION

Calcaneus also referred to as heel bone forms an irregular block of bone, which is a major component of the skeleton of the hindfoot and prominence of the heel. The calcaneus is the longest, strongest, and largest of all the tarsal bones. Most of the heel pains are associated with a spur. Calcaneal spurs can be of two types: Achilles and plantar.<sup>2,3</sup> Plantar

and Achilles spurs are highly prevalent in older people and the development of spur differs between men and women. In individuals < 50 years of age, spur (Achilles and plantar) formation is more strikingly common in women than it is in men.<sup>4</sup> While “plantar heel spur” reflects bone formation at the plantar insertion of the plantar fascia and muscles, “dorsal heel spur” is exostotic bone formation at the insertion of Achilles tendon.<sup>5</sup> Intra-articular incongruity, varus and valgus misalignment of the heel, widened heel due to lateral bulge, shorter heel height, decreased ankle dorsiflexion, and elevated Achilles tendon insertion leading to weakening of the gastrocnemius-soleus complex can result in enthesophyte formation in the calcaneus.<sup>6</sup> Previous studies suggest that calcaneal spurs are more common in those who have decreased elasticity of the plantar heel fat pad that occurs in older people, females, overweight or obese, in diabetes mellitus and osteoarthritis. These factors combine to create a pathologic overload and micro tears in the fascia at the calcaneal

insertion. Tears lead to inflammation where subsequently calcium gets deposited and spur develops.<sup>7,8</sup> Present study was undertaken to assess the incidence of heel pain related to calcaneal spurs at a tertiary hospital.

**MATERIAL AND METHODS**

Present study was a prospective, observational study done in Department of Orthopaedics, SBHGMC and Sarvopchar Rughalaya, Dhule from July 2019 to June 2020. Patients coming to orthopaedics out-patient department with complaints of posterior heel pain were considered for present study. A written informed consent was taken from study participants.

**Inclusion criteria**

Patients, above 18 years, persistent heel pain at least for three months and pain score as per Wong-Bakers criteria more than 4, willing to participate and follow up.

**Exclusion criteria**

Patients with complaints of bilateral heel pain. Patients who have had old ankle fractures, foot deformities or any other infective or traumatic pathology involving

talar and sub talar joints were excluded from the study. Not willing for follow up

Basic demographic details, complaint details, medical history were noted. A thorough clinical examination with special focus on painful heel was done. Heel pain was measured as per Wong-Bakers pain scale. Patients were explained each face represents a person who has no pain, or some, or a lot of pain. Face 0 doesn't hurt at all. Face 2 hurts just a little bit. Face 4 hurts a little bit more. Face 6 hurts even more. Face 8 hurt a whole lot. Face 10 hurts as much as you can imagine, although you don't have to be crying to have this worst pain. Patients were asked to choose the face that best depicts the pain they are experiencing. Each patient underwent lateral view X ray of ankle joint for painful heel.

Radiological diagnosis of calcaneal spur was made and reported by senior radiologist with at least 10 years-experience. Details were noted in proforma and entered in excel sheet. Statistical analysis was done using descriptive statistics.

**RESULTS**

Total 100 patients were studied during study period. Most common age group was 41-60 years (65 %) with mean age as 51.5 ± 9.4 years. Female (62%) predominance was noted. 29 % patients had BMI above normal (more than 25 kg/m<sup>2</sup>). Common associated conditions were Diabetes (12 %), osteoarthritis (11%). Calcaneal spur was noted in 41% cases (22% had in right heel while 19% had in left heel). Achilles (25%) and plantar (16%) spurs were noted.

**Table 1: General characteristics**

Patient characteristics	Number of patients (n=100) / Mean ± SD
Age (years)	
19-40	11
41-60	65
61-80	21
More than 80	3
Mean age (years)	51.5 ± 9.4
Gender	
Males	38
Females	62
BMI (kg/m <sup>2</sup> )	
Normal (18-25)	71
Overweight (25.1-30)	22
Obese (> 30)	7
Associated conditions	
Diabetes	12
Osteoarthritis	11
Hypertension	9
Rheumatoid arthritis	6
Heel spur	
Present	41
Absent	59
Location of the heel spur	
Right	22
Left	19
Type	
Achilles	25
Plantar	16

## DISCUSSION

A spur or an enthesophyte is defined as a bony outgrowth at the site of attachment of a ligament or tendon into a bone and grows further in the direction of natural pull of that ligament or tendon. The plantar calcaneal spurs (PCS) are a bony outgrowth from the calcaneal tuberosity and has been studied via numerous methods including cadavers, radiography, histology and during surgery.<sup>9</sup> PCS originate from the calcaneal tuberosity, located on the posterior plantar surface of the calcaneus. The majority of PCS arise from the medial process of the tuberosity, but they can also originate from the lateral processes and the sulcus. According to this literature review, a bony growth larger than 2 mm should constitute a spur, clearly distinguishing them from simple cortical irregularities.<sup>10</sup> The possible explanations for a symptomatic calcaneal spur include large size spur, fracture of the spur, nerve entrapment and fat pad abnormalities resulting in increased shock transmission to the spur. Extrinsic causes such as occupational environment, level of physical activity and footwear may also play a role in the development of symptomatic calcaneal spurs.<sup>4</sup> Plantar fasciitis due to calcaneal spur is one of the most common causes for inferior heel pain. It is frequently diagnosed in sportsmen and professional athletes accounting for 10% total injuries.<sup>2</sup> In the study by Lourdes RK,<sup>11</sup> 118 patients with calcaneal spur were studied, 60% of them were female showing an increased preponderance in females compared to males. The most affected age group being 40-50 years of age. The incidence of spurs both in plantar and the site of insertion of Achilles were found to be 24% of the total calcaneal spurs. Similar findings were noted in present study. Spur formation to be part of a degenerative process resulting in osteophyte formation appearing in the form of bony growth. Its prevalence among women could be correlated with footwear, obesity and pregnancy resulting in excessive compressive forces acting at the calcaneum over a period of time.<sup>10</sup> Histological analysis of the spur has revealed degeneration and proliferation of fibrocartilaginous tissue along with areas of ossification, further strengthening the argument that this may be a degenerative rather than an inflammatory condition.<sup>10</sup> This probably is because the enthesis organ dissipates the stress away from the bony insertion, this can explain why the pathological changes take place adjacent to the enthesis as well as at them.<sup>12</sup> An alternative explanation proposed by Kumai and Benjamin, which could be termed the vertical compression hypothesis, argues that calcaneal spurs develop in response to repetitive compression rather than traction. Specifically, they suggest that calcaneal spurs are fibrocartilaginous outgrowths which form in response to calcaneal stress fractures, in an attempt to protect the calcaneus against microcracks.<sup>13</sup> Excess body mass may

accelerate the degenerative processes occurring in the plantar heel region, particularly in the presence of age-related stiffening of the plantar heel pad. However, it is also possible that obesity results in greater flattening of the medial longitudinal arch, which then creates additional traction on the plantar fascial insertion and subsequent spur development. Although plantar spurs can be identified in a variable percentage of patients with plantar heel pain, their significance is not clear. Rogers *et al.*<sup>14</sup> studied the association of enthesophytes (bone formation at a ligament attachment) and osteophytes (bone formation at the edge of a joint) and found that these 2 conditions present together when present and also occur at multiple sites, indicating that patients with spurs might be “bone formers.” Similarly, Ahmad *et al.*,<sup>15</sup> found no correlation between the size or shape of the spur with symptoms (i.e., small spurs were likely to have worse symptoms than large spurs). They concluded that the spur is not the source of inflammation and pain but an incidental finding. American College of Foot and Ankle Surgeons Clinical Consensus Statement noted that “In most cases, infracalcaneal heel pain is a soft tissue-based disorder and calcaneal spurring is most likely not a causative factor” was appropriate.<sup>16</sup> Moroney *et al.*,<sup>17</sup> evaluated the clinical symptoms and lateral radiographs of 1103 patients with and without calcaneal spurs. Their findings were similar to others reporting more overall foot pain in patients with spurs and an increase incidence of spurs with obesity, increased age, diabetes, and osteoarthritis. They concluded that the presence of calcaneal spurs might be an indicator of foot pain, independent of plantar fasciitis, and that spurs themselves do not cause the pain but might be indicators of associated conditions. In present study 29% patients had BMI more than 25. Menz *et al.*,<sup>18</sup> noted that after adjusting for age and gender, those with PCS were 6.9 times more likely to be obese compared with those without PCS. Also the point of maximal tenderness was directly underneath the spur and that those with PCS were 4.6 times more likely to have a current or previous history of heel pain. In present study 12% patients had diabetes. Moroney *et al.*,<sup>17</sup> found that those with PCS were four times as likely to have diabetes than those without PCS; however, it is unclear if this is an independent risk factor. The association between calcaneal spurs and heel pain has led to the development of several interventions directly targeted at the spur, including surgical excision, extracorporeal shockwave therapy and radiation therapy.<sup>19-21</sup> Present study was a small sample, single institute study with no control group. Further research on the normal anatomy and histology of the calcaneal tuberosity along with the variation present within the population would provide a valuable comparison for those with symptomatic heels both with and without PCS.

## CONCLUSION

Presence of calcaneal spurs might be an indicator of foot pain, spurs themselves do not cause the pain but might be indicators of associated conditions. Spur formation to be part of a degenerative process resulting in osteophyte formation appearing in the form of bony growth.

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