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# A study to evaluate the anatomical examination of calcaneal articular facet and squatting facet, focusing on their co-relation with Talus neck

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KEYWORDS	ABSTRACT		
(Received: 03 Ja KEYWORDS Tali, Squatting facet, Neck of tali, Articular facet	ABSTRACT Aim: The aim of articular facet a facet with differ Methods: The COLLEGE, KA of sex from De studied for varior deviation were f Results: Right a with 24 and 20 talus, 18 patient	Revised:10 march 2024.Accepted:15 April 2024)TIm of the present study was to assess the anatomical study on types of calciet and squatting facet with emphasis on anatomical co-relation of squaifferent angles at the neck of Talus.The present study was conducted at AUTONOMOUS STATE MEDIKANPUR DEHAT, UP, INDIA on 100 (right-52, left-48) dry tali irrespentn Department of Anatomy. Articular surface of talus on inferior surfationere measured with the help of Goniometer.ght and left side type II articular facets were equally common in our same 20 individuals, respectively. Second highest was Type III articular facet1 20 individuals, respectively. Second highest was Type IV and V were least.	
<ul> <li>was no significant difference in lateral sq sided bone patients. Right side mean ex and left side 112. Mean angle of deviation difference was discovered 1 deviation did not correlate with lateral s strong correlation between angle of inclin value 0.007.</li> <li>Conclusion: Differences in articular face make the joint more stable. Changing t reflects population lifestyle, habits, an dorsiflexion, climbing, extended standing</li> </ul>		nt difference in lateral squatting ents. Right side mean extremel 2. Mean angle of deviation erence was discovered betwee of correlate with lateral squatting in between angle of inclination fferences in articular facets on it more stable. Changing the nec- ion lifestyle, habits, and pos- mbing, extended standing, and p	aspect between 22 right-sided and 18 left- y important angle of inclination was 124 was 26.5 on right and 25.4 on left. No n right and left talus angles. Angle of g facet presence or absence ( $p > 0.05$ ). A and squatting facet was established with p nferior tali affect joint safety; three facets k of the tali to create a squatting aspect ture. People squat owing to excessive pes cavus.

### **INTRODUCTION**

The articular morphology of the human skeleton may be sensitive to alteration by forces exerted upon it. Habitual sitting has long been acknowledged to affect the skeletal morphology of the lower leg. Squatting is a resting postural complex that includes hyperflexion at the hip and knee and hyper dorsiflexion at the ankle and subtalar joints. During movement, the foot is seldom dorsiflexed enough to bring the anterior border of the inferior extremity of the tibia into touch with the dorsum of the

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neck of the talus. Thus changes of the neck of the talus and the distal tibia suggesting their regular contact have been considered as evidence of the considerable dorsiflexion of the ankle that occurs in squatting.<sup>1,2</sup>

The foot is especially adapted both physically and functionally for bipedal locomotion and consequently receives considerable selection pressure to cope with both balance and propulsion in a highly efficient fashion.<sup>3</sup> In stationary posture and during movement Talus is one of the vital bones as it bears the weight of the whole body. Its fundamental relevance comes in the fact that it creates a connecting connection between the bones of leg and foot and receives a lot of stress owing to regular day to day activities. Its integrity is crucial for all locomotor motions. It is also unusual amongst all the bones in the foot by virtue of its utter lack of any muscle attachments and fragile blood supply.<sup>4</sup>

The talar angles comprise the neck angle (NA), vertical angle (VA) and torsion angle (TA). The NA is defined as the outer angle subtended between the axis of the head and neck of talus and an imaginary plane drawn across the superior articular surface via the mid-points of the tibial and fibular articular surfaces on each side of the body of talus. The VA is the angle created between the axis of the head of the talus and the line connecting the top of the medial talar articular surface to the tip of the posterior tubercle. The TA is calculated as the angle between the transverse axis of the articular surface of the head of the talus and an imaginary transverse axis coinciding with the plane above the superior articular surface of the talus.<sup>5</sup>

The objective of this research was to evaluate the anatomical characteristics of the calcaneal articular facet and squatting facet, with a particular focus on the anatomical relationship between the squatting facet and various angles at the neck of the Talus.

### MATERIALS AND METHODS

The present study was conducted at Department of Anatomy ,AUTONOMOUS STATE MEDICAL COLLEGE, KANPUR DEHAT, UP, INDIA on 100 (right-52, left-48) dry tali irrespective of sex. Articular surface of talus on inferior surface is studied for various types of their incidence. Angle at the neck i.e angle of inclination and deviation were measured with the help of Goniometer. Squatting facets were observed as well. Difference in angle of inclination and declination with or without accessory facet were obtained by using student t test method.

### RESULTS

Facets	Right	Left	Total
Туре І	8	10	18
Type II	24	20	44
Type III	18	14	32
Type IV	0	2	2
Type Va	1	0	1
Type Vb	1	2	3

#### Table 1: Incidence of types of articular facets on tali

Type II articular facets were highest in its incidence in our study with no difference in right and left side viz. 24 patients and 20 patients respectively. Second highest being Type III articular facet on talus without any difference on right and left side viz. 18 patients and 14 patients respectively. Type IV and Type V were least types of articular facet.

Table 2: Squatting facets on tall				
Side	Present	Present		
	Medial	Lateral		
Right	0	22	30	
Left	0	18	30	

Lateral squatting facet was found in 22 patients of the bones on right side in 18 patients on left side, showing no significant difference.

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Table 3: Angle of Inclination and deviation			
Angles	Right	Left	p value
Inclination(M±SD)	124±6	112±8	0.0030
deviation(M±SD)	26.5±3.2	25.4±2.4	0.07

The mean highly significant incidence of angle of inclination on right side was 124 and on left side 112. Angle of deviation mean we found was 26.5 on right side

and 25.4 on left side. We found no significant difference between angle on right and left side of talus.

Table 4: Angle of deviation and inclination with o	r without squatting facet
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Angles	squatting facet +	squatting facet -
Deviation (M±SD)	Right 25.9±2.4	26.3±2.6
	Left 27.5±3.2	25.6±4
Inclination (M±SD)	Right 124±3.6	96±4
	Left 119±2.6	101±3.4

There was no significant co relation between angle of deviation and presence or absence of lateral squatting facet p value >0.05. With angle of inclination we found there is significant co relation between angle of inclination and squatting facet with p value 0.007. Indicating those tall where squatting facet was present, angle of inclination was larger significantly.

### DISCUSSION

The talus is the second biggest bone in the foot and serves as a connection between the bones of the leg and foot. It plays a crucial role in bearing weight and transmitting it to the ground. The absence of muscle and tendinous connection in the joint makes it inherently unstable, increasing its susceptibility to trauma, accidents, and biomechanical stress. These factors may lead to the development of arthritic alterations in the subtalar joint (Verhagen, 1993).<sup>6</sup> Variations in the occurrence of various kinds of articular facets may be attributed to disparities in gait, the anatomical composition of the population, or racial distinctions. The ethnic and individual variations in the anatomical structure of the talus bone significantly influence both the static and dynamic movements of the foot.<sup>7</sup> Hence, a previous understanding of articulation and different anatomical variations in articulation is important not only for identifying underlying illnesses but also for their treatment.

The occurrence of Type II articular facets was most frequent in our research, with no difference between the right and left sides, seen in 24 patients and 20 patients, respectively. The second greatest occurrence is a Type III articular facet on the talus, which is present in 18 individuals on the right side and 14 patients on the left side. The articular facets known as Type IV and Type V were the least common forms. This discovery is consistent with the findings of Bilodi<sup>8</sup> and Garg et al<sup>9</sup>, who reported rates of 50% and 43.7% respectively. Arora et al<sup>10</sup> reported the greatest occurrence of type I facets at 78%, whereas Kaur et al<sup>11</sup> detected a lower prevalence at 24%.

Different factors, such as race, gait style, individual physique, and living environment (whether on flat surfaces or hilly places), have been identified as potential causes for variances in calcaneal facets on the talus. Variances may arise due to the influence on the axis of motion between the Talus and Calcaneum, leading to distinct locations in relation to the applied load and force. According to Bruckner<sup>12</sup>, the presence of three facets on the talus contributes to its stability and restricts its mobility. On the other hand, a design with just two facets would result in more mobility but decreased stability. The one facet arrangement is highly mobile due to the fusion of all facets into one, resulting in the least stable joint. A lateral squatting facet was seen in 22 individuals on the right side and in 18 patients on the left side of the bones, with no significant variation. The average incidence of angle of inclination on the right side was 124, while on the left side it was 112. These values were comparable to the findings of a research conducted by Motagi et al<sup>13</sup>. However, in their investigation, there was no variation in angle of inclination between the right and left sides of the tali. This discrepancy may be attributed to the lower sample size used in their study. In our research, we observed that the artificial intelligence (AI) on the right side was much higher than on the left side of the tali bone. This indicates

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that the medial arch of the right foot has a greater capacity to respond to stress.

The measured angle of deviation was 26.5 degrees on the right side and 25.4 degrees on the left side. There was no statistically significant correlation seen between the angle of deviation and the existence or absence of the lateral squatting facet, with a p-value greater than 0.05. By analyzing the angle of inclination, we discovered a substantial correlation between the angle of inclination and the presence of a squatting facet, with a p-value of 0.007. The angle of inclination was much bigger in the tali where the squatting facet was present. The statistical analysis of the current research revealed that there was no significant correlation between the existence of a squatting facet and the angle of declination. However, talus bones with a lateral squatting facet exhibited a significantly greater AI compared to those without the facet.

### CONCLUSION

Differences in articular facets on inferior tali affect joint safety; three facets make the joint more stable. Changing the neck of the tali to create a squatting aspect reflects population lifestyle, habits, and posture. People squat owing to excessive dorsiflexion, climbing, extended standing, and pes cavus. These variances may be utilized to examine joints before surgery, as anthropological markers for race and area, and in forensics.

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