

An Anatomical Evaluation of Incidence and Types of Calcaneal Facets on Talus and Co Relation between Squatting Facets and Angles of Neck

Pallavi¹, Priyanka Raj², Birendra Kumar Sinha³

¹Tutor, Department of Anatomy, Patna Medical College, Patna, Bihar, India

²Tutor, Department of Anatomy, Vardhman institute of medical sciences, Pawapuri, Nalanda, Bihar, India

³Associate Professor, Patna Medical College, Patna, Bihar, India

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Corresponding author: Dr. Priyanka Raj

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Abstract

Aim: To determine incidence and types of calcaneal facets on talus and co relation between squatting facets and angles of neck

Material & Methods: Study was conducted on 130 (right-68, left-62) dry tali irrespective of sex from Department of Anatomy, Patna Medical College, Patna, Bihar, India for three months. Articular surface of talus on inferior surface is studied for various types of their incidence.

Results: Lateral squatting facet was found in 46% of the bones on right side 38.4% on left side, showing no significant difference. With angle of inclination, we found there is significant co relation between angle of inclination and squatting facet with p value 0.001. Indicating those tali where squatting facet was present, angle of inclination was larger significantly.

Conclusion: Incidence of calcaneal articular facet and modification on neck of talus (squatting facet with high AI) are attributed to differences in race, habitual activities, posture, gait and level of plane used for locomotion by Indian population.

Keywords: Tali, Squatting facet, Neck of tali, Articular facet.

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Introduction

The foot is particularly specialized both anatomically and functionally for bipedal locomotion and subsequently undergoes strong selection pressure to deal with both balance and propulsion in a highly efficient way [1].

In stationary position and during movement Talus is one of the important

bones as it carries the weight of the entire body. Its main importance lies in the fact that it forms a connecting link between the bones of leg and foot and undergoes a lot of stress due to routine day to day activity. Its integrity is vital for all locomotor movements. It is also unique amongst all the bones in the foot by virtue of its total

absence of any muscular attachments and tenuous blood supply [2].

The talar angles include 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 through the mid-points of the tibial and fibular articular surfaces on either side of the body of talus. The VA is the angle formed between the axis of the head of the talus and the line connecting the summit of the medial talar articular surface to the tip of the posterior tubercle. The TA is measured as the angle between the transverse axis of the articular surface of the head of the talus and an imaginary transverse axis corresponding with the plane above the superior articular surface of the talus.[3]

Squatting is a resting postural complex involving hyperextension at the hip and knee, dorsiflexion at the ankle and subtalar joint [4]. Skeletal morphology of the lower limb has been recognised to be subjected to modifications by the stress upon it. The anterior margin of the lower end of the Tibia is bevelled due to extreme dorsiflexion of the ankle, the lower end of the Tibia articulates with the facet or facets on the dorsal aspect of the neck of the talus. They may be lateral or medial in position and usually the lateral one is often continuous with the trochlear articular surface [5].

Paucity of blood supply and no muscular attachment make the talus more prone for injury, makes joints unstable and increases the risk of Osteoarthritis, Psuedoarthrosis and Neurosis.[4] For radiological and direct intra operative visualization of talar neck position and the angles the neck is forming with body is essential to assess the accuracy of reduction thereby prevent malunion. These values are also important for kinesiology and anthropology. In the present study we report the morphometry

of squatting facet in the talus with emphasis on anatomical co relation between presence of this facet with angles on the neck like angle of inclination and declination and there is no data available on such correlation.

Material & Methods:

Study was conducted on 130 (right-68, left-62) dry tali irrespective of sex from Department of Anatomy, Patna Medical College, Patna, Bihar, India for three months. 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:

Table 1 shows incidence of different types of articular facets on inferior surface of tali. Type II articular facets were highest in its incidence in our study with no difference in right and left side viz. 46% and 43% respectively. Second highest being Type III articular facet on talus without any difference on right and left side viz. 34.3% and 31.2% respectively. Type IV and Type V were least types of articular facet.

Table 2 shows incidence of squatting facet. Lateral squatting facet was found in 46% of the bones on right side 38.4% on left side, showing no significant difference. In our study we did not find any medial squatting facet.

Table 3 shows mean highly significant incidence of 115. Angle of deviation mean we found was 25.4 on angle of inclination on right side is 124 and on left side right side and 24.6 on left side. We found no significant difference between angle on right and left side of talus.

Table 4 shows there is 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 0.001. Indicating those tali where squatting facet was present, angle of inclination was larger significantly.

Table 1: Incidence of types of articular facets on tali

Facets	Right	Left	Total
Type I	3.4%	10.4%	16.8%
Type II	46%	43%	46%
Type III	34.37%	31.22%	31.6%
Type IV	0	3.10%	1.8%
Type Va	2%	0%	1.8%
Type Vb	3.18%	1.38%	3.6%

Table 2: Squatting facets on tali

Side	Present		Absent
	Medial	Lateral	
Right	0%	46%	54%
Left	0%	38.4%	61.6%

Table 3: Angle of Inclination and deviation

Angles	Right	Left	p value
Inclination(M±SD)	124±4	111±6	0.001
deviation(M±SD)	25.4±3.3	24.6±2.4	0.08

Table 4: Angle of deviation and inclination with or without squatting facet

Angles	squatting facet +	squatting facet -
Deviation (M±SD)	Right 25.4±2.4	26.7±2.6
	Left 27.3±3.3	25.4±3
Inclination (M±SD)	Right 125±3.4	95±5
	Left 116±2.3	100±3.1

Discussion:

Talus is the second largest of the tarsal bones takes part in the formation of talocrural, subtalar and talocalcaneonavicular joints [4,6]. Squatting facets on the dorsal surfaces of the neck of the Talus in the foetus of oriental races provide evidence for inheriting acquired characters. Barnett also suggested that Squatting facets are more commonly seen in European foetuses than in adults [6]. Evidence suggest that Indian foetus inherit no greater expression of squatting facets than the European fetus and the fetal presence of such facets

appears likely to result from the considerable dorsiflexion of the foot that occurs during intrauterine life [7].

The mean TSA obtained in the present study was 9.7 ± 3.3 degrees. Other studies have reported values ranging from 9.9 to 11.87 degrees [8-9]. The shape and orientation of the trochlear surface is vital in allowing for smooth joint motion and in providing ankle stability [10-12]. Previous studies have attempted to analyze the trochlear groove by using linear parameters and the talar dome ratio. [13-14]

The prevalence of medial squatting facet (33, 34.4%) in the present study was greater than that reported by Oygucu et al. (1, 0.6%), and Das (4%) [4, 15] but less than that observed Singh (46, 17.6%) [16]. Comparatively less prevalence was observed by Barnet [7] in his study less than that reported by Singh [16] in his study on Indians (74, 24.6%).

Garg et al [17] who observed 50% and 43.7% respectively. Though Arora et al [18] observed highest incidence of type I facets 78% and Kaur et al 24%. [19] [6]

Conclusion:

Incidence of calcaneal articular facet and modification on neck of talus (squatting facet with high AI) are attributed to differences in race, habitual activities, posture, gait and level of plane used for locomotion by Indian population.

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