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Original Research Article

An Observational Assessment of Anatomical Co-Relation of Squatting Facet with Different Angles at the Neck of Talus

Archana Kumari[1], Shishir Kumar[2], Kumari Suman[3], Birendra Kumar Sinha[4]

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

[2]Professor, Department of Community Medicine, ESIC Medical College, Bihta, Patna, Bihar, India

[3]Tutor, Department of Anatomy, Patna Medical College, Patna, Bihar, India

[4]Professor and HOD, Department of Anatomy, Patna Medical College, Patna, Bihar, India

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Corresponding Author: Dr Shishir Kumar
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Abstract

Aim: The aim of the present study was to assess the anatomical study on types of calcaneal articular facet and squatting facet with emphasis on anatomical co-relation of squatting facet with different angles at the neck of Talus.

Methods: The present study was conducted in the Department of Anatomy, Patna Medical College, Patna, Bihar, India for seven months, and on 100 (right-52, left-48) dry talus irrespective of sex from Department of Anatomy. 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.

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

Conclusion: Differences in the articular facets on inferior surface of tali is attributed to the significance related to safety of joint i.e. presence of three facets make the joint more stable. Modification on neck of tali leading to formation of squatting facet reflects life style, habitual activities and postural adaptation of population. Occurrence of squatting facet is not only because of postural adaptation like squatting position due to extreme dorsiflexion, but also attributed to climbing, prolonged standing and pes cavus in the individuals.

Keywords: Tali, Squatting face, Neck of talus Articular facet

Introduction

The articular morphology of the human skeleton can be subject to modification by stresses imposed upon it. Habitual squatting has long been recognized to alter the skeletal morphology of the lower limb. Squatting is a resting postural complex that involves hyperflexion at the hip and knee and hyper dorsiflexion at the ankle and subtalar joints. During locomotion, the foot is rarely dorsiflexed sufficiently to bring the anterior border of the inferior extremity of the tibia into contact with the dorsum of the neck of the talus. Thus, modifications of the neck of the talus and the distal tibia indicating their habitual contact have been taken as evidence of the extreme dorsiflexion of the ankle that occurs in squatting. [1,2]

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. [3] 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. [4]

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. [5]

The aim of the present study was to assess the anatomical study on types of calcaneal articular facet and squatting facet with emphasis on anatomical co-relation of squatting facet with different angles at the neck of Talus.

Materials and Methods

The present study was conducted in the Department of Anatomy, Patna Medical College, Patna, Bihar, India for seven Months, and on 100 (right-52, left-48) dry talus irrespective of sex from Department of Anatomy. 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: Incidence of types of articular facets on tali

Facets	Right	Left	Total
Type I	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

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 talus

Side	Present		Absent
	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.

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 or without squatting facet

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 talus where squatting facet was present, angle of inclination was larger significantly.

Discussion

Talus is the 2nd largest bone of foot, connecting link between 2 bones of leg and foot thereby involved in weight bearing and transmission of weight to the ground. It has no muscular and tendinous attachment, making it an unstable joint which is more likely to suffer trauma, accidents, or other biomechanical stress resulting in development of arthritic changes in subtalar joint (Verhagen, 1993). [6] Differences in incidence of different types of articular facets could be due to differences in gait, built structure of population or racial differences. The racial and individual differences of the anatomic construction of tali play a key role on static and kinetic dynamic on the foot.[7] Therefore, prior knowledge of articulation and various anatomical variations in articulation holds significance not only in delineating underlying pathologies but also in its treatment.

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. This observation is comparable with study done by Bilodi [8] and Garg et al [9] who observed 50% and 43.7% respectively. Though Arora et al [10] observed highest incidence of type I facets 78% and Kaur et al [11] 24%.

Various reasons have been described for variations on calcaneal facets on talus, some being due to different races, types of gait, built of an individual, plane of living could be level surface/hilly areas. Some variations could be because of impact on position of axis of movement between Talus and Calcaneum resulting in different positions relative to load and force. Bruckner [12] opined that 3 facets on talus makes it more stable and less mobile, 2 facets configuration would be more mobile and less stable. The one facet configuration is the most mobile since all the facets have blended into one making it least stable joint. Lateral squatting facet was found in 22 patients of the bones on right side in 18 patients on left side, showing no significant difference. The mean highly significant incidence of angle of inclination on right side was 124 and on left side 112 which were similar to study done by Motagi et al [13] but in his study, for AI there was no difference on right and left side tali could be due to smaller sample size. In our study AI on right side was significantly high as compared to left side talus, depicting functional adaptability of medial arch to stress on the right foot.

Angle of deviation mean we found was 26.5 on right side and 25.4 on left side. 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 talus where squatting facet was present, angle of inclination was larger significantly. Statistical analysis of present study showed no significant co relation between presence of squatting facet and angle of declination and there were talus with lateral squatting facet, which had significant larger AI in comparison with those without the facet.

Conclusion

Differences in the articular facets on inferior surface of talus is attributed to the significance related to safety of joint i.e. presence of three facets make the joint more stable. Modification on neck of talus leading to formation of squatting facet reflects life style, habitual activities and postural adaptation of population. Occurrence of squatting facet is not only because of postural adaptation like squatting position due to extreme dorsiflexion, but also attributed to climbing, prolonged standing and pes caves in the individuals. These variations can be used, for assessing the joints before surgery, as anthropological marker for racial and regional differences and in forensic sciences also.

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