



A STUDY OF MORPHOMETRY OF ARTICULAR SURFACE OF TALUS:

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ABSTRACT

Background: This weight bearing quality of the talus makes it susceptible to wear and tear and so the measurements that we might get in study may actually help the orthopaedics surgeon in reconstruction. Study in India on this topic is very limited and we use a lot of morphometric values from the western world. What we should understand is the fact that Indians are anthropologically different and it is time to study our own morphometric values, so that the values can be used by the orthopaedic surgeons and ultimately the patients get benefitted by this.

Very few attempts have been put sincerely to study the morphometry of talus. The sheer strain put on it by the weight of the adult is tremendous and so the structure to be studied is very interesting.

KEYWORDS : Morphometry, Articular Surface, Talocrural Joint, Synovial Joint.

INTRODUCTION:

Very few attempts have been put sincerely to study the morphometry of the superior articulating surface of talus. The sheer strain put on it by the weight of the adult is tremendous and so the structure to be studied is very interesting.

This weight bearing areas of the talus makes it susceptible to wear and tear and so the measurements that we might get in study may actually help the orthopaedics surgeon in reconstruction. Study in India on this topic is very limited and we use a lot of morphometric values from the western world. What we should understand is the fact that Indians are anthropologically different and it is time to study our own morphometric values, so that the values can be used by the orthopaedic surgeons and ultimately the patients get benefitted by this.

One sixth of the static load of the human body is carried by the fibula at the tibiofibular joint¹. These require a high degree of stability which is determined by the passive and dynamic factors². The passive stability depends on the contour of the articular surfaces of the participating bones of the joints. Talocrural joint is an approximately uniaxial joint³. Although it is considered to be a simple hinge, its axis of rotation slightly changes, during dorsiflexion and plantar flexion. Starting from the plantigrade position, the normal range of dorsiflexion is 10° when the knee is straight and 30° with the knee flexed. The range of normal plantar flexion is 30°. Dorsiflexion results in the joint adopting the 'close-packed' position³, with maximal congruence and ligamentous tension; from this position. All major thrusting movements are exerted, in walking, running and jumping. The malleoli grip the talus, and even in relaxation no appreciable lateral movement can occur without stretch of the inferior tibiofibular syndesmosis and slight bending of the fibula. The superior talar surface is broader in front, and in dorsiflexion the malleolar gap is increased by slight lateral rotation of the fibula, by 'give' at the inferior tibiofibular syndesmosis and gliding at the superior tibiofibular joint.

The empirical axis of ankle joint passes distal to tips of malleoli at 5 mm ± 3 mm range, (0 to 11 mm) distal to the tip of medial malleolus and 3 mm ± 2 mm range (0 to 12 mm) distal to and 8 mm ± 5 mm anterior to the tip of lateral malleolus³. The axis is inclined downwards and laterally in the frontal plane and is rotated posterolaterally in the horizontal or transverse plane. In the frontal plane, the angle between empirical axis of the ankle and midline of the tibia is 82.7 degrees ± 3.7 degrees, with a range of 74 to 94 degrees in the transverse plane, the angle of ankle axis with the transverse axis of the knee is 20 to 30 degrees. Some workers

recognized two axis to the ankle joint^{4,5}. A dorsiflexion axis inclined downwards and laterally and a plantar flexion axis included downward and medially. The changeover occurs within a few degrees of the neutral position of the talus.

So a sincere effort has been made in this study to study the morphometry of talus that participate in the formation of talocrural joint.

AIMS AND OBJECTIVES:

1. To study the morphometry of articular surface of talus.

MATERIALS AND METHODS:

Thirty specimen were studied in the Department of Anatomy, K.S.Hegde Medical Academy

This study was done from Dec 2016 to Dec 2017



IMAGE 22: Length Measurements Of Superior Articulating Surface Of Talus Taken At Different Levels.

IMAGE 23: Width Measurements Of Superior Articulating Surface Of Talus Taken At Different Levels.

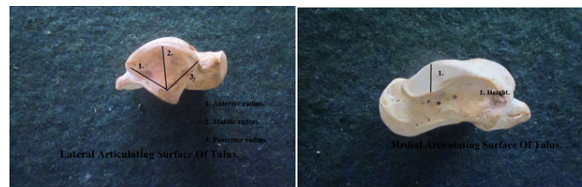


IMAGE 24: Measurements Of Lateral Articulating Surface Of Talus Taken At Different Levels.

IMAGE 25: Measurements Of Medial Articulating Surface Of Talus Taken At Different Levels.

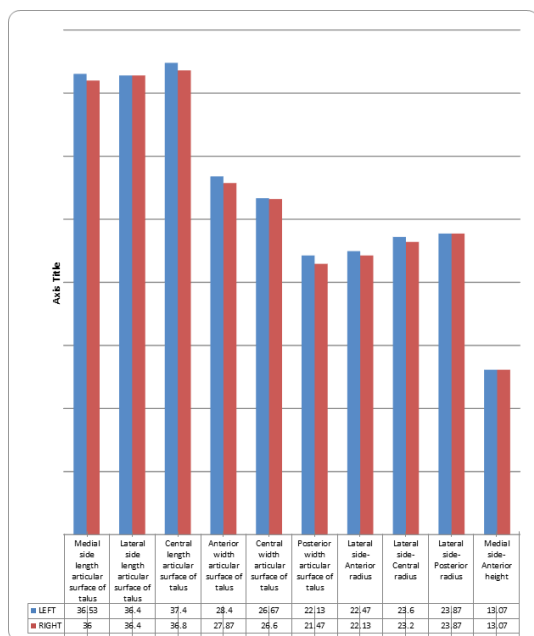
RESULTS:

TABLE 1: Morphometry Of Each Side In Dry Talus.

	SIDE	Mean	Std. Deviation	P VALUE
Medial side length	LEFT	36.53	3.35	0.654
	RIGHT	36	3.09	

Lateral side length	LEFT	36.4	3.18	1
	RIGHT	36.4	2.41	
Central length	LEFT	37.4	2.41	0.486
	RIGHT	36.8	2.24	
Anterior width	LEFT	28.4	1.72	0.347
	RIGHT	27.87	1.30	
Central width	LEFT	26.67	1.87	0.924
	RIGHT	26.6	1.92	
Posterior width	LEFT	22.13	1.68	0.288
	RIGHT	21.47	1.68	
Anterior radius	LEFT	22.47	1.30	0.437
	RIGHT	22.13	0.99	
Central radius	LEFT	23.6	1.24	0.355
	RIGHT	23.2	1.08	
Posterior radius	LEFT	23.87	1.24	1
	RIGHT	23.87	0.99	
Anterior height	LEFT	13.07	1.03	1
	RIGHT	13.07	0.88	

Table No.8



GRAPH NO. 1: Comparison In The Morphometry Of Different Sides In The Articulating Surfaces Of The Dry Talus. X-axis: Components To Be Measured. Y-axis: Measurement In Mm.

DISCUSSION:

Irrespective of the side to which the bone belongs, the mean values of the length of superior trochlear surface of talus on the medial, lateral and central part are 36.26 mm, 36.4 mm and 37.1 mm. The mean values of the width of superior trochlear surface of talus on the anterior, central and posterior part are 28.13 mm, 26.63 mm and 21.8 mm. The mean values of the anterior, middle and the posterior radius on the lateral articulating surface are 22.3 mm, 23.4 mm and 23.8 mm. The mean value of the anterior height on the medial side is 13.06 mm.

The length is almost similar throughout, though the lateral side is little more than lengthier than the other side measurements. From the above measurements it is clear that the articular surface is wider in front and narrows posteriorly. The lateral articular surface forms an arc of a circle because the radius in different regions is almost similar in length.

On the right side, the mean length measurements are 36 mm, 36.4 mm and 36.8 mm with a standard deviation of 3.094 mm, 2.414 mm

and 2.242 mm. The mean width measurements are 27.87 mm, 26.6 mm and 21.47 mm with a standard deviation of 1.302 mm, 1.92 mm and 1.685 mm. The mean radius measurements are, 22.13 mm 23.2 mm, and 23.87 mm with a standard deviation of 0.99 mm, 1.082 mm and 0.99 mm. The mean height value is 13.07 mm, with a standard deviation of 1.033 mm.

On the left side, the mean length measurements are 36.53 mm, 36.4 mm and 37.4 mm with a standard deviation of 3.357 mm, 3.18 mm and 2.414 mm. The mean width measurements are 28.4 mm, 26.67 mm and 22.13 mm with a standard deviation of 1.724 mm, 1.877 mm and 1.685 mm. The mean radius measurements are 22.47 mm, 23.6 mm and 23.87 mm with a standard deviation of 1.302 mm, 1.242 mm and 1.246 mm. The mean height value is 13.07 mm, with a standard deviation of 0.884 mm.

The measurements on both sides are similar.

According to the study by Rosdi Daud et al.⁶ on three dimensional morphometric study of the trapezium shape of the trochlear tali, the anterior width and the posterior width was measured in 99 participants (49 females and 50 males).

The mean anterior width was found to be 32.36 mm with a standard deviation of 2.36 mm and a range of 25.56 mm to 37.74 mm in males. In females, it was 28.38 mm with a standard deviation of 1.68 mm and a range from 25.11 mm to 32.39 mm.

The posterior mean width was measured to 26.31 mm with a standard deviation of 2.07 mm and a range of 20.88 mm to 31.21 mm in males. In females, the mean width was found to be 22.98 mm with a standard deviation of 1.63mm and the range from 19.97 mm to 26.53 mm.

On the right side, the mean anterior width was measured to be 30.47 mm with a standard deviation of 2.8 mm. On the left side, it was measured to be 30.32 mm with a standard deviation of 2.93 mm.

On the right side, the mean posterior width was measured to be 24.92 mm with a standard deviation of 2.37 mm. On the left side, it was measured to be 24.39 mm with a standard deviation of 2.61 mm.

The measurements are lower when compared. It may be because of the population difference.

In the study of ankle morphometry on 3D-CT images by Andrea Hayes et al.¹⁴ in 21 subjects (10 females and 11males), the mean width on the anterior part was 29.9 mm with a standard deviation of 2.6 mm, in the middle the mean width in the middle measured to be 27.9 mm with a standard deviation of 3 mm and on the posterior part it measured 25.2 mm with a standard deviation of 3.7 mm.

The study is in agreement with the study of Andrea Hayes et al.⁷

CONCLUSION:

The morphometry of the cartilage has been successfully done and this may be of immense value to the surgeon in reconstruction works. The work has a lot of potential in the future. Individual variations can be of great value in Forensic Science and in Physical Anthropology

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