

## MORPHOMETRIC STUDY OF THE ARTICULAR SURFACES OF BONES FORMING THE TIBIO-FIBULAR MORTISE IN SOUTH INDIAN POPULATION

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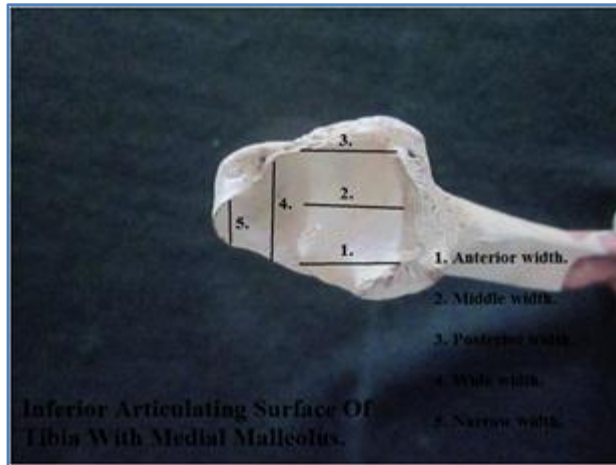
**ABSTRACT:** Talocrural joint is major weight bearing joint of the body, since human is the only known obligate bipedals. Therefore the body weight is transmitted to the ground through the two lower limbs. So some great features have been evolved in humans to keep the body upright. The lower end of the tibia with its medial malleolus and lateral malleolus of fibula form a deep recess to accommodate the body of talus. Study is done using 30 Tibias (15 right side and 15 Left side) and 30 fibulas (15 right side and 15 Left side). Measurements were similar on both sides. The study was found to be in agreement with that of the other studies.

**KEYWORDS:** Talocrural joint, Malleolus, Tibia & Fibula.

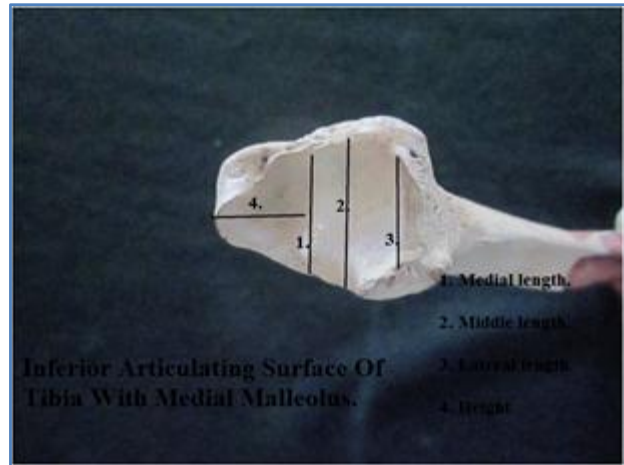
**INTRODUCTION:** The talocrural joint is a major weight bearing joint of the body<sup>1</sup>. The weight of the body is transmitted from the tibia and fibula to the talus which distributes the weight anteriorly and posterior within the foot. One sixth of the static load of the leg is carried by the fibula at the tibiofibular joint.<sup>2</sup> The passive stability depends on the contour of the articular surfaces, the integrity of the collateral ligaments, the integrity of the distal tibiofibular ligaments, the reticular system around the ankle and the crossing and attached tendon tunnels.<sup>3</sup> The lower end of tibia along with its medial malleolus and the lateral malleolus of the fibula form a deep recess to accommodate the body of talus. The mortise formed by the lower end of tibia and the fibula is usually considered syndesmosis. The tibiofibular joints permit only slight movement. Due to the varying slope of the talar lateral malleolar surface, the fibula rotates laterally a little bit during dorsiflexion at the ankle, the bones being also slightly separated. Slight bending or torsion of the fibular shaft may permit movements at the distal tibiofibular joint. Ankle is one of the most frequently injured joint<sup>4</sup> and very limited amount of studies is available on morphometry of the articular surfaces of bones forming the Tibio-fibular mortise which will help in the reconstruction surgeries and in the manufacture of implants in south Indians.

**MATERIAL & METHODS:** This study is done in the department of Anatomy K. S. Hegde Medical Academy Deralakatte Mangalore by using 30 Tibias (15 right side and 15 Left side) and 30 fibulas (15 right side and 15 Left side). The measurement that were taken on the articulating surface of tibia and fibula are medial side length, central length, lateral length, anterior width, central width, posterior width, medial malleolus (wide width), medial malleolus (narrow width), medial malleolus (height), lateral malleolus (width), lateral malleolus (height). All the measurements were taken using a thread and digital calipers.

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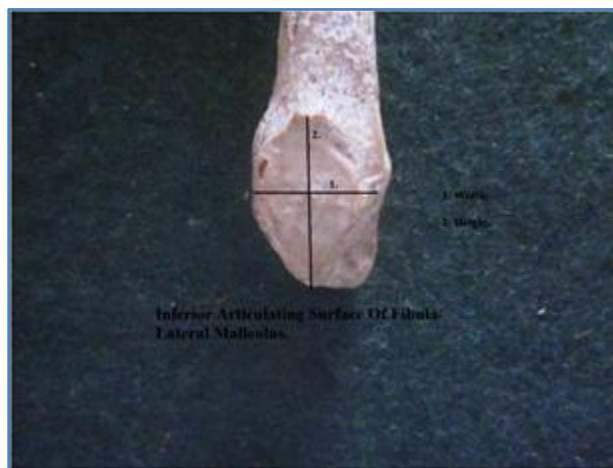
**IMAGE 1**



**IMAGE 2**

**Image 1 (left):** Width measurements of inferior articulating surface of tibia and length measurements of medial malleolus taken at different levels.

**Image 2 (right):** Length measurements of inferior articulating surface of tibia and medial malleolus taken at different levels.



**IMAGE 3**

**Image 3:** Morphometry of inferior articulating surface of fibula (lateral malleolus).

## OBSERVATION AND RESULTS:

MORPHOMETRY OF ARTICULATING SURFACE IN TIBIA (DRY BONES):

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	Side	Mean	Std. Deviation	Sig.
Medial side length	L	23.56	1.99	0.82
	R	23.71	1.54	
Central length	L	26.19	2.42	0.802
	R	26.43	2.79	
Lateral length	L	28.5	3.34	0.527
	R	27.71	3.36	
Anterior width	L	28.25	2.29	0.424
	R	28.93	2.26	
Central Width	L	25.25	1.98	0.429
	R	25.79	1.62	
Posterior Width	L	23	1.82	0.317
	R	22.36	1.59	
Medial Malleolus (wide width)	L	22.19	2.48	0.683
	R	21.86	1.79	
Medial Malleolus (Nar.Width)	L	11.56	1.50	0.346
	R	11.07	1.26	
Medial Malleolus (Height)	L	14.88	1.70	0.83
	R	15	1.41	

**Table 1: Morphometry of each side in dry tibia**

Irrespective of the side to which the bone belongs, the mean values of the length of the tibial plafond on the medial, central and lateral part are 23.63 mm, 26.3 mm and 28.13 mm. The mean values of the width of tibial plafond on the anterior, central and posterior part are 28.56 mm, 25.5 mm and 22.7 mm. The mean measurements of wide width, narrow width and the height of the medial malleolus are 22.03 mm, 11.33 mm and 14.93 mm. On the right side, the mean length measurements are 23.71 mm, 26.43 mm and 27.71 mm. The mean width measurements are 28.93 mm, 25.79 mm and 22.36 mm. The mean measurements of the medial malleolus are 21.86 mm, 11.07 mm and 15 mm.

On the left side, the measurements are 23.56 mm, 26.19 mm and 28.5 mm. The mean width measurements are 28.25 mm, 25.25 mm and 23 mm. The mean measurements of the medial malleolus are 22.19 mm, 11.56 mm and 14.88 mm.

### MORPHOMETRY OF ARTICULAR SURFACE IN FIBULA (DRY BONE):

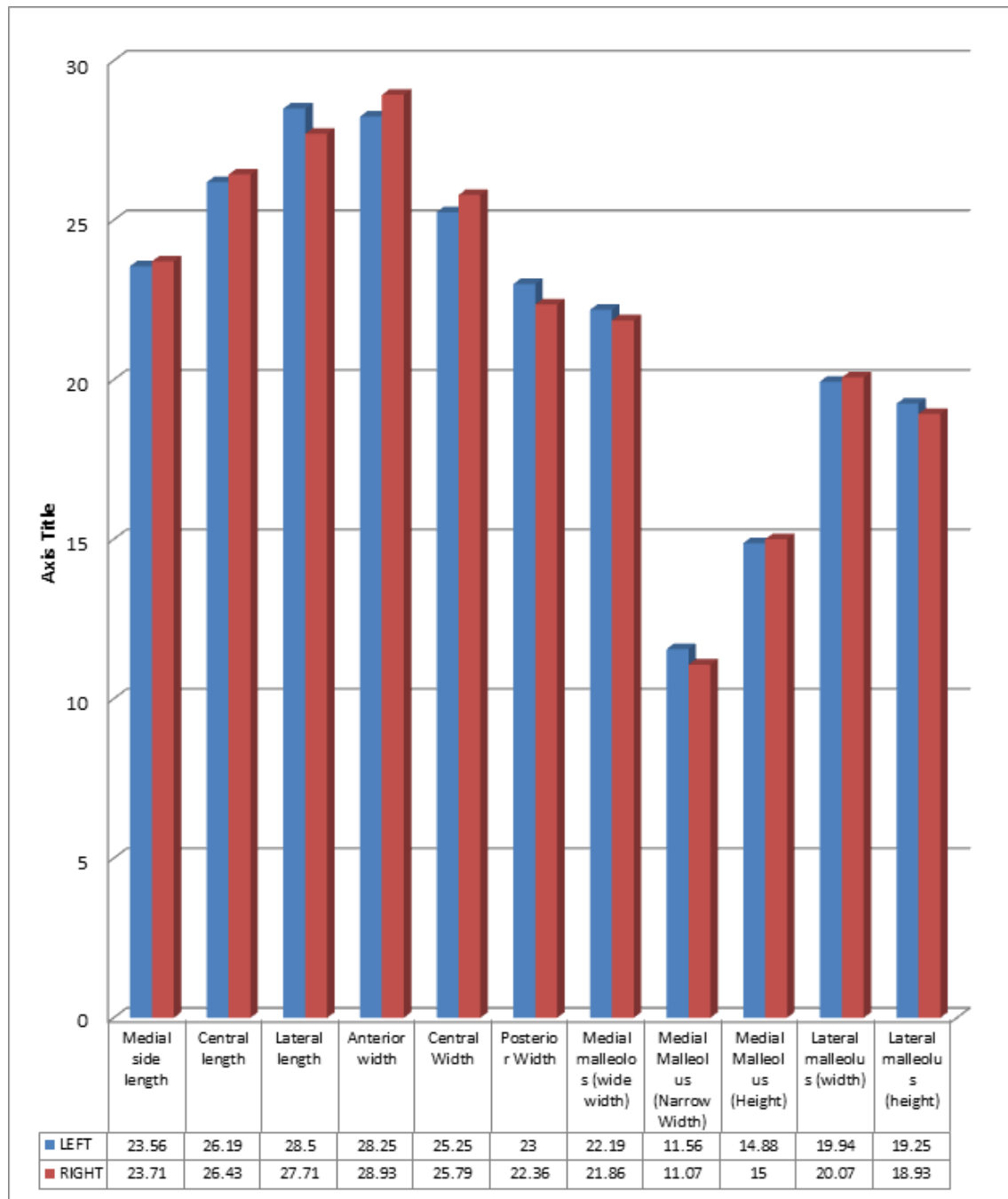
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	Side	Mean	Std. Deviation	Sig.
Lateral malleolus (width)	Left	19.94	1.181	0.816
	Right	20.07	1.9	
Lateral malleolus (height)	Left	19.25	1.528	0.632
	Right	18.93	2.093	

Table 2: Morphometry of each side in dry fibula

Irrespective of the side to which the bone belongs, the mean value of the height of the articulating surface of the fibula is 19.1 mm. The mean value of the breadth of the articulating surface of fibula is 20 mm. On the right side, the mean height measurement is 18.93mm. The mean width measurement is 20 mm. On the left side, the height width measurement is 19.25 mm. The mean width measurement is 19.94 mm.



**GRAPH NO. 1**

**Graph No. 1:** Comparison in the morphometry of different sides in the articulating surfaces of dry tibia and fibula. X-axis: Components to be measured. Y-axis: measurement in mm.

**DISCUSSION: MORPHOMETRY OF ARTICULAR SURFACE IN TIBIA DRY (BONE):**

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Irrespective of the side to which the bone belongs, the mean values of the length of the tibial plafond on the medial, central and lateral part are 23.63 mm, 26.3 mm and 28.13 mm. The mean values of the width of tibial plafond on the anterior, central and posterior part are 28.56 mm, 25.5 mm, and 22.7 mm. The mean measurements of wide width, narrow width and the height of the medial malleolus are 22.03 mm, 11.33 mm and 14.93 mm. The lateral side measurement is little than the other length measurements. The articular surface is wider in front and narrows posterior.

On the right side, the mean length measurements are 23.71 mm, 26.43 mm and 27.71 mm with a standard deviation of 1.541 mm, 2.793 mm and 3.361 mm. The mean width measurements are 28.93 mm, 25.79 mm and 22.36 mm with a standard deviation of 2.269 mm, 1.626 mm and 1.598 mm. The mean measurements of the medial malleolus are 21.86 mm, 11.07 mm and 15 mm with a standard deviation of 1.791 mm, 1.269 mm and 1.414 mm.

On the left side, the measurements are 23.56 mm, 26.19 mm, and 28.5 mm with a standard deviation of 1.999 mm, 2.428 mm and 3.347 mm. The mean width measurements are 28.25 mm, 25.25 mm and 23 mm with a standard deviation of 2.295 mm, 1.983 mm and 1.826 mm. The mean measurements of the medial malleolus are 22.19 mm, 11.56 mm and 14.88 mm with a standard deviation of 2.482 mm, 1.504 mm and 1.708 mm.

The measurements are similar on both sides.

Mandela Pamela et al.<sup>5</sup> in their study on "Estimation of the length of the tibia from dimensions of the distal articular surfaces of the tibia in adult Kenyans" Out Of 156 tibiae the mean measurements of the following were;

Width of the tibial plafond was measured as 26.55 mm with a standard deviation of 2.18 mm.

Length of the tibial plafond was measured as 28.61 mm with a standard deviation of 2.31 mm.

Height of the medial malleolus was measured as 14.19 mm with a standard deviation of 1.89 mm.

Breadth of the medial malleolus was measured as 21.88 mm with a standard deviation of 2.22 mm.

Misiani Musa et al.<sup>6</sup> studied the Sexual dimorphism in the morphometric characteristics of the tibial plafond and medial malleolus.

The mean values of Width of the tibial plafond 26.55±2.18 mm, in males it was 26.82±1.84 mm, in females it was 25.15±1.53 mm.

Mean length of the tibial plafond was 28.61±2.39 mm in males it was 29.87±1.84 mm, in females it was 27.76±1.78 mm.

Mean Height of the medial malleolus 14.19±1.89 mm, in males it was 15.03±1.69 mm, in females it was 14.49±1.17 mm.

Mean Breadth of the medial malleolus 21.88±2.22 mm, in males it was 22.09±1.98 mm, in females it was 20.85±1.81 mm.

The measurements in our study are in agreement with the study of Mandela Pamela et al<sup>5</sup> and Misiani Musa et al.

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**MORPHOMETRY OF ARTICULAR SURFACE IN FIBULA DRY (BONE):** Irrespective of the side to which the bone belongs, the mean value of the height of the articulating surface of the fibula is 19.1 mm. The mean value of the breadth of the articulating surface of fibula is 20 mm. On the right side, the mean height measurement is 18.93 mm, with a standard deviation of 2.093 mm. The mean width measurement is 20.07 mm with a standard deviation of 1.9 mm. On the left side, the mean length measurement is 19.25 mm, with a standard deviation of 1.528 mm. The mean width measurement is 19.94 mm with a standard deviation of 1.181 mm. The measurements are similar on both sides.

**CONCLUSION:** Morphometry of articulating surface in tibia (dry bones): The lateral length measurement is higher than the other length measurements. Articular surface is wider in front and narrows posterior. The measurements are similar on both sides.

Morphometry of articular surface in fibula (dry bone): The measurements are similar on both sides.

This study will help in the reconstruction surgeries and in the manufacture of implants in south Indians.

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