

# Anthropometric Analysis of Talocrural Joint Based on Radiological Study in South Indian Population

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**Abstract:** *The ankle joint is one of the most frequently injured joint<sup>1</sup>. The lateral ligament is injured more often when compared to medial. The strong eversion pull on the deltoid ligament causes transverse fracture of medial malleolus. If the tibia is carried anteriorly, the posterior margin of the distal end of the tibia is also broken by the talus producing a trimalleolar fracture. Conventionally X-ray techniques have been used to diagnose ligament injuries. Magnetic resonance (MR) imaging has opened new horizons in the diagnosis and treatment of many musculoskeletal diseases of the ankle and foot. It demonstrates abnormalities in the bones and soft tissues before they become evident at other imaging modalities. But in the present scenario in our country MRI scanning is not available commonly and if available it is very expensive and the procedure is time consuming. So the present study emphasizes on diagnosis of sprains using the common x-rays which are available locally and are easily affordable.*

**Keywords:** Ankle, Injured, Magnetic resonance, Medial malleolus, X-rays

## 1. Introduction

The talocrural joint is a major weight bearing joint of the body. The weight of the body is transmitted from the tibia and fibula to the talus which distributes the weight anteriorly and posteriorly within the foot. These require a high degree of stability which is determined by the passive and dynamic factors<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. The dynamic stability is conferred by gravity, muscle action, and the reaction between the foot and the ground.

The ankle joint is one of the most frequently injured joint<sup>1</sup>. The ankle injuries occur in the plantar flexed position of the foot. The lateral ligament is injured more often when compared to medial. A sprained ankle results due to tear of anterior talofibular and calcaneofibular ligaments when the foot is twisted in lateral direction. In forcible eversion of the foot the deltoid ligament may be torn. At times the deltoid ligament pulls the medial malleolus thereby causing avulsion fracture of the malleolus. Potts fracture occurs when the foot is caught in the rabbit hole in the ground and the foot is forcibly everted. In this condition at first there is an oblique fracture of shaft and lateral malleolus of fibula. The strong eversion pull on the deltoid ligament causes transverse fracture of medial malleolus. If the tibia is carried anteriorly, the posterior margin of the distal end of the tibia is also broken by the talus producing a trimalleolar fracture.

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common x-rays which are available locally and are easily affordable using simple criteria.

## 2. Material and Methods

Thirty X - rays were also collected from the Department Of Radiology, K.S.Hegde Medical Academy were measured for:

- Talocrural Angle.
- Tibial overlap.
- Tibiofibular distance.
- Joint Space A.
- Joint Space B.

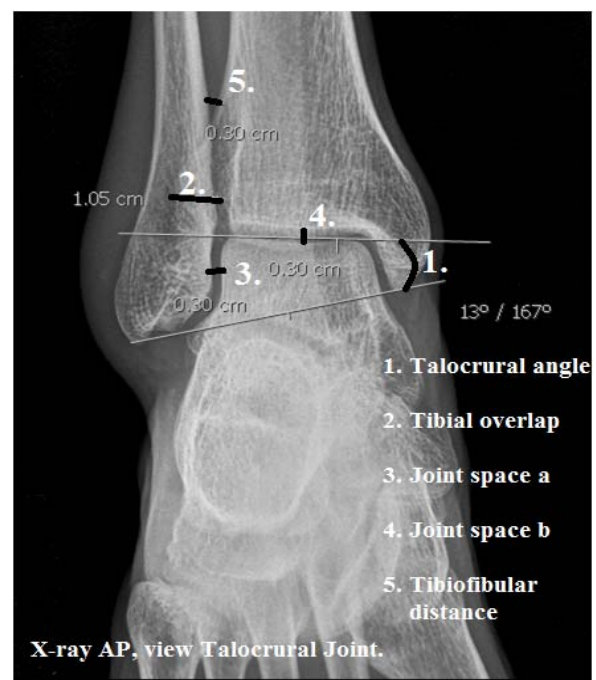


Image 1: X-ray, AP view measurements

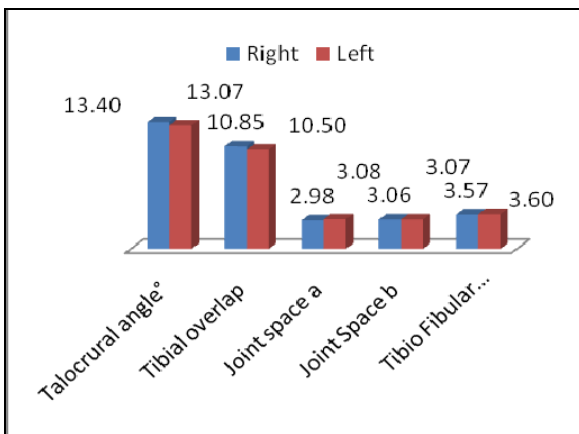
They were measured using, a computer software which was used in the department of radiology, K.S.Hegde Medical

Academy. 15° internal rotation radiographs of both ankles in 15 adults formed the material.

### 3. Observation and Results

**Table 1:** Morphometry in each side and gender

	Side	Mean	Std. Deviation	Sig. (2-tailed)
Talocrural angle°	R	13.4	1.59	0.57
	L	13.06	1.57	
Tibial overlap	R	10.85	0.74	0.165
	L	10.5	0.60	
Joint space a	R	2.98	0.39	0.528
	L	3.08	0.46	
Joint Space b	R	3.06	0.36	0.963
	L	3.06	0.39	
Tibio Fibular Distance space	R	3.56	0.36	0.776
	L	3.6	0.25	



**Graph 1:** side comparison in radiological parameters

**X-axis:** Components to be measured. **Y-axis:** measurement in mm.

Irrespective of the side to which it belongs, the mean value of the talocrural angle is 13.23 degrees, tibial overlap is 10.67 mm, tibiofibular distance is 3.58 mm, joint Space A is 3.03 mm, joint Space B is 3.06 mm. The mean length values on the right side are 13.4 degrees, 10.85 mm, 3.56 mm, 2.98 mm and 3.06 mm. The mean length values on the left side are 13.06 degrees, 10.5 mm, 3.6 mm, 3.08 mm and 3.06 mm. The mean length values in the males are 13.26 degrees, 10.5 mm, 3.64 mm, 3.03 mm and 3.11 mm. The mean length values in the females are 13.2 degrees, 10.85 mm, 3.52 mm, 3.02 mm and 3.01 mm.

### 4. Discussion

The measurements are similar on both sides. M.S. Patil et al.<sup>3</sup> in their study on anthropometric measurements of ankle mortise for evaluating mortise fracture reductions with an aim to develop contoured implants measured the talocrural angle, tibiofibular clear space, tibiofibular overlap and compared joint clear space at two places. Anteroposterior radiographs, of both Ankles in 20 adult individuals formed the material. They agree with that the talocrural angle of two ankles of a given individual does not vary by more than 2 degrees. Tibiofibular clear space on Anteroposterior radiographs measured a mean value of 2.4 mm with a standard deviation of 1.3 mm. Tibiofibular overlap on Anteroposterior radiographs was measured as 11.2 mm with a standard deviation of 4.4 mm. Joint spaces at two levels

were almost equal. The study on Three-dimensional morphological characteristics measurement of ankle joint based on computed tomography image post-processing by Chen Yan-xi et al.<sup>4</sup> The mean talocrural angle (10.01±0.38°) was measured to be 10.1 degrees with a standard deviation of 0.38 degrees. Tibiofibular clear space mean measurements were 2.78 mm, with a standard deviation of 0.19 mm. They were not significance correlated with gender, height and weight ( $P > 0.05$ ) in 30 cases in 15 males and 15 females. The study is in agreement with the other studies.

### 5. Conclusion

The measurements are similar on both sides. The talocrural angle of two ankles of a given individual does not vary by more than 2 degrees. There is a lot of future scope in the study. The study was based in the south Indian population. The study has a lot of future scope. Regional variations can be recorded and presented to make this study more specific. Even sexual difference if any, can be noted and presented. It gives a fairly quick and affordable diagnostic approach to sprains of the ligaments of ankle joint.

### Acknowledgment

The present study is based upon the Dissertation work done by Dr. Shishirkumar under the guidance of Dr. Sathesha Nambiar. It would be impossible to complete the work without the help of Dr. Arunachalam Kumar in the Dept. of Anatomy, K.S.Hegde Medical Academy, Mangalore, Nitte University.

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### Author Profile



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