

# Sex Difference in the Anthropometry of Ankle Joint Based on Plain X-Rays

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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. 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. Thirty X - rays formed the study material. In the developing country like ours, the MRI is not easily available and even if it is available it is not affordable and also the procedure is time consuming. The different criteria have been studied but the sex comparison of the criterias has never been done in the south Indian population

**Keywords:** Ankle, Affordable, Injured, Magnetic resonance, X – rays.

## 1. Introduction

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. 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.

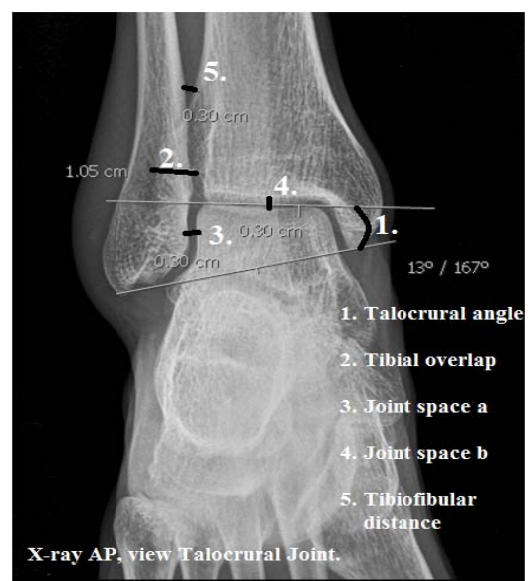
X-ray techniques have been used to diagnose ligament injuries. Magnetic resonance (MR) imaging has opened new horizons in the diagnosis and treatment of many musculoskeletal diseases of the ankle and foot. It demonstrates abnormalities in the bones and soft tissues before they become evident at other imaging modalities.

But in the developing country like ours, the MRI is not easily available and even if it is available it is not affordable and also the procedure is time consuming. The different criteria have been studied but the sex comparison of the criterias has never been done in the south Indian population.

## 2. Materials 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.



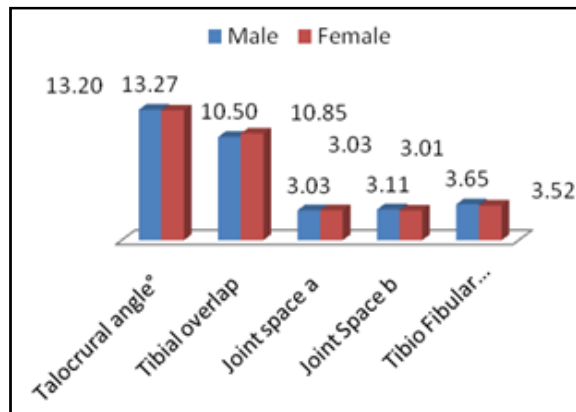
**Image 1:** X-ray, AP view measurements

They were measured using, a computer software which was used in the department of radiology, K. S. Hegde Medical Academy. The X-Rays were taken with 15 degrees internal rotation.

## 3. Observation and Results

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

	Sex	Mean	Std. Deviation	Sig. (2-tailed)
Talocrural angle°	M	13.26	1.62	0.91
	F	13.2	1.56	
Tibial overlap	M	10.5	0.54	0.166
	F	10.85	0.79	
Joint space a	M	3.03	0.49	0.967
	F	3.02	0.36	
Joint Space b	M	3.11	0.43	0.479
	F	3.01	0.32	
Tibio Fibular Distance Space	M	3.64	0.29	0.274
	F	3.52	0.32	



**Graph 1:** Gender comparison in radiological parameters  
**X-axis:** Components to be measured. **Y-axis:** measurement in mm.

Irrespective of the sex 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

Irrespective of the side and sex to which it belongs, the mean value of the Talocrural Angle is 13.23 degrees, tibial overlap 10.67 mm, tibiofibular distance is 3.58 mm, joint Space A is 3.03 mm, joint Space B is 3.06mm and joint space a equals joint space b.

The mean length in the males are 13.26 degrees, 10.5 mm, 3.64 mm, 3.03 mm and 3.11 mm with a standard deviation of 1.62 degrees, 0.54 mm and 0.29 mm, 0.49 mm and 0.43 mm. Joint space a is almost equal to joint space b.

The mean length in the females are 13.2 degrees, 10.85 mm, 3.52 mm, 3.02 mm and 3.01 mm with a standard deviation of 1.56 degrees, 0.79 mm and 0.32 mm, 0.36 mm and 0.32 mm. Joint space a is almost equal to joint space b.

The measurements are similar in both sexes.

M.S. Patil et al.<sup>2</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>3</sup> The mean talocrural angle ( $10.01 \pm 0.38^\circ$ ) 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

In the developing country like ours, the MRI is not easily available and even if it is available it is not affordable and also the procedure is time consuming. The different criteria have been studied but the sex comparison of the criterias has never been done in the south Indian population. Our study forms a base for future study because any regional variations and sexual difference can be identified. It forms an easy way to diagnose any ligament sprains. The study has a lot of future scope. Regional variations if any, can be identified and the study may help the orthopaedicians to easily diagnose and treat the patients in a better way.

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#### References

- [1] Bruce D. Beynon, Darlene F. Murphy, Denise M. Alosa Predictive Factors for Lateral Ankle Sprains. *J Athl Train.* 2002; 37(4): 376-380.
- [2] M.S. Patil, S.M.G. Raza, Md. Nayeem Ali. Anthropometric measurements of ankle mortise for evaluating mortise fracture reductions with an aim to develop contoured implants. *Al Ameen J Med Sci* 2012; 5(4): 381-387.
- [3] Chen Yan-xi, Lu Xiao-ling, Bi Gang, Yu Xiao, Hao Yi-li, Zhang Kun, Zou Li-ling, Mei Jiong, Yu Guang-rong. Three-dimensional morphological characteristics measurement of ankle joint based on computed tomography image post-processing. *Chin Med J.* 2011; 124(23): 3912-3918.

#### Author Profile



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