



A Morphometric Study of Distal Articulating Surfaces of Tibia and Fibula in South Indian Population with its Clinical Implications

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ABSTRACT

Ankle is one of the most commonly injured joint so, for its reconstruction surgeries and in the manufacture of its implants various dimensions of lower articulating end of tibia and fibula are needed. So, this study was done to measure various dimensions of distal articulating end of tibia and fibula. 48 adult fully ossified dry tibiae and 36 fibulae were taken and various measurements of the distal end of both tibia and fibulae were measured using vernier caliper. Statistical analysis of the parameters was done. The total (right + left) mean values of the length of the tibial plafond on the medial, central and lateral part are 2.51, 2.74 and 2.73cm. The total mean values of the width of tibial plafond on the anterior, central and posterior part are 1.61, 1.73 and 1.99cm. The total mean measurements of medial length, lateral length and the width of the medial malleolus are 1.32, 2.38 and 2.29 cm. The mean and standard deviation of all the parameters of right, left fibula is shown in Table 2. The total mean value of the length and width of tibial facet of fibula is 2.04 and 1.65cm. There was no statistical significance in any parameter of right and left side as P value in all was >0.05. The results of this study will be useful for Orthopaedic surgeons while making implants for the lower end of tibia and fibula.

Keywords: Tibia, Fibula, Malleolus, Ankle joint, Implants.

INTRODUCTION

The talocrural joint is a chief weight bearing joint of the body.¹ The weight of the body is conveyed from the tibia and fibula to the talus which distributes the weight anteriorly and posterior within the foot.²

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 made by the inferior end of tibia and the fibula is commonly considered as syndesmosis.³

The tibial articulation with the talus occurs mainly with the tibial plafond (TP); a saddle shaped facet on the distal end of the tibia and the medial surface of the medial malleolus (MM).⁴

The morphometry of the distal tibia is significant when the stability of these articulations is put into account.⁵

Furthermore, these morphometric parameters are also clinically important in imaging diagnosis of fractures of the TP and the MM.^{6,7}

Ankle is one of the most commonly injured joint and there is very limited amount of literature available on morphometry of the distal articular surfaces of tibia and fibula which will help in the reconstruction surgeries and in the construction of implants in south Indians. So, this study was undertaken to measure various parameters of distal articulating surfaces of tibia and fibula.

MATERIALS AND METHODS

The study was carried out on 48 dry tibiae (23 right and 25 left) and 36 fibulae (19 right and 17 left).

All bones were adult type and without any signs of erosion. Following parameters were studied on tibia and fibula:

Tibial Plafond (Fig. 1)

- a) Medial side length : Anteroposterior length on medial side.
- b) Central length: Anteroposterior length in the middle.
- c) Lateral length : Anteroposterior length on lateral side.
- d) Anterior width: Mediolateral length in anterior part.
- e) Central width: Mediolateral length in middle part.
- f) Posterior width: Mediolateral length in posterior part.

Medial malleolus (Fig. 2)

- a) Medial length: Anteroposterior length on medial side.
- b) Lateral length: Anteroposterior length on lateral side
- c) Height: The distance from its base at the tibial plafond to its tip.

Fibula inferior articulating surface (lateral malleolus) (Fig. 3)

b) Width: Anteroposterior diameter in the middle.

a) Height: The distance from its tip to its most proximal point.

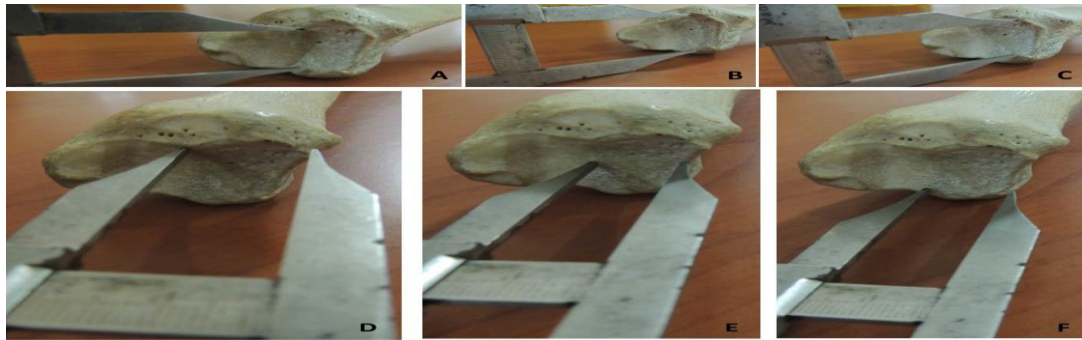


Figure 1: Showing measurements done on tibia Plafond. A.) Medial side length. B.) Central length C.) Lateral length D.) Anterior width E.) Central width F.) Posterior width.

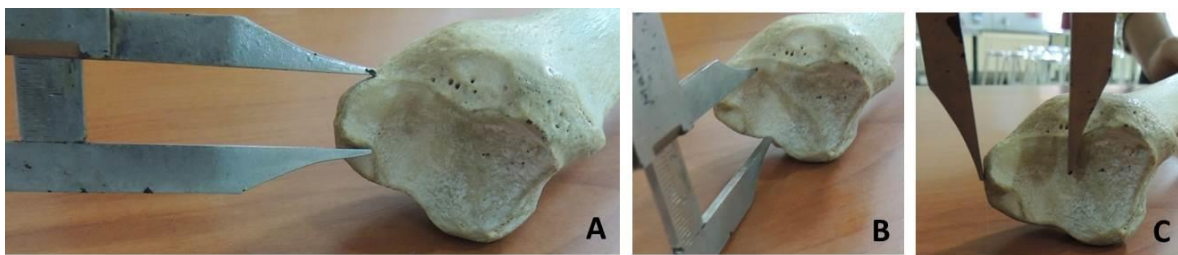


Figure 2: Showing measurements done on Medial Malleolus. A. Medial length B. Lateral length C. Height



Figure 3: Showing measurements done on fibula inferior articulating surface (lateral malleolus). A. Height B. Width.

All measurements were taken with the help of vernier caliper. Statistical analysis was done for all the parameters. Paired sample T test was done to see the statistical significance between right and left side.

RESULTS

The mean and standard deviation of all the parameters of right, left tibia is shown in Table 1.

Table 1: Showing measurements done on distal end of tibia of both sides.

Parameters		Mean ± SD	P value
Medial side length	Right	2.50 ± 0.21	.820
	Left	2.52 ± 0.25	
Central length	Right	2.76 ± 0.22	.700
	Left	2.72 ± 0.27	
Lateral length	Right	2.80 ± 0.25	.089

Anterior width	Left	2.66 ± 0.33	.886
	Right	1.60 ± 0.22	
Central width	Left	1.62 ± 0.32	.128
	Right	1.78 ± 0.19	
Posterior width:	Right	2.02 ± 0.19	.438
	Left	1.96 ± 0.33	
Medial malleolus: Medial length	Right	1.31 ± 0.23	.468
	Left	1.32 ± 0.24	
Medial malleolus: Lateral length	Right	2.36 ± 0.25	.580
	Left	2.41 ± 0.29	
Medial malleolus: Width	Right	2.30 ± 0.20	.740
	Left	2.28 ± 0.22	

The total (right + left) mean values of the length of the tibial plafond on the medial, central and lateral part are 2.51, 2.74 and 2.73cm.

The total mean values of the width of tibial plafond on the anterior, central and posterior part are 1.61, 1.73 and 1.99cm. The total mean measurements of medial length, lateral length and the width of the medial malleolus are 1.32, 2.38 and 2.29 cm.

The mean and standard deviation of all the parameters of right, left fibula is shown in Table 2.

Table 2: Showing measurements done on distal end of fibular tibial facet of both sides.

Parameters		Mean ± SD	P value
Length	Right	2.03 ± 0.16	.725
	Left	2.04 ± 0.25	
Width	Right	1.66 ± 0.21	.875
	Left	1.64 ± 0.20	

The total mean value of the length and width of tibial facet of fibula is 2.04 and 1.65cm.

There was no statistical significance in any parameter of right and left side as P value in all was >0.05.

DISCUSSION

The measurements of the distal end of tibia and fibula are vital in considering the stability of ankle joint, in designing of prostheses for use in ankle arthroplasty and in interpretation of diagnostic images of the ankle joint.⁸

Patil GV found the total mean values of the length of the tibial plafond on the medial, central and lateral part as 2.36, 2.63 and 2.81 cm while in our studies we got the values as 2.51, 2.74 and 2.73cm. They got the total mean values of the width of tibial plafond on the anterior, central and posterior part as 2.85, 2.55 and 2.27 cm and we got it as 1.61, 1.73 and 1.99cm.

The total mean measurements of medial, lateral length and width of the medial malleolus in their study was 2.20, 1.13 and 1.49cm in our study the values are 1.32, 2.38 and 2.29 cm. In their study the total mean value of the length and width of the articulating surface of the fibula is 1.91 and 2.00 cm while in our study it was 2.04 and 1.65cm.³

Pamela M, Fessy MH and Mariani and Patella found the width of the medial malleolus as 1.41, 1.31 and 1.34cm

the result of Mandela's study are similar to our study and we got the value as 1.49cm but the measurements of Fessy and Mariani and Patella are less than that of our study^{7,9,10}. Musa M studied the Sexual dimorphism in the morphometric characteristics of the tibial plafond and medial malleolus. They found the width of the medial malleolus as 1.41cm in males and 1.44cm in females which was also similar to our study.⁸

These results of the study will help in the reconstruction operations and in the construction of implants of the ankle joint in south Indian population.

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