

A Prospective Study to Assess the Proximal and Distal Dimensions of Tibia and Its Correlation with Length of Tibia: An Institutional Based Study

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Abstract

Background: Tibia is a long bone of the leg which lies medial to fibula and is exceeded in length only by femur. The present study was undertaken for assessing the Proximal and Distal Dimensions of Tibia and Its Correlation with Length of Tibia. **Materials & Methods:** A total of 40 dry and processed tibias, irrespective of side, grossly normal and complete were obtained. Using a vernier caliper, measurements were taken on the bone. The length of tibia was defined as the vertical distance from the superior point on the medial tibial condyle to the inferior point on the medial malleolus. The following measurements were taken on the fibular incisura: Width of the fibular incisura, Depth of the fibular incisura, Height of the fibular incisura, Medial malleolus, Breadth of medial malleolus, Width of the tibial plafond, and Length of the tibial plafond.

Results: A total of 40 Tibial specimens were analyzed. While analyzing the results through Pearson's correlation, it was seen that length of tibia was significantly correlated with depth of fibula incisura of both distal and proximal tibia. **Conclusion:** From the above results, authors concluded that length of tibia was significantly correlated with depth of fibula incisura of both distal and proximal tibia.

Keywords: Tibia, Proximal, Distal.

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Introduction

Tibia is a long bone of the leg which lies medial to fibula and is exceeded in length only by femur. Distal end of tibia is slightly expanded, distal surfaces. It projects inferomedially as the medial malleolus. The distal end when compared to proximal end is laterally rotated (tibial torsion). Tibial torsion is about 30 degree in Caucasian and oriental populations, but is significantly greater in Africans. Smooth anterior surface bulges beyond the distal surface, separated from it by a narrow groove, continuing the shaft's lateral surface. Medial surface of shaft and malleolus is subcutaneous and visible. Posterior surface is crossed near its medial end by an oblique groove[1-3]. Its anatomy is responsible for it being the most fractured bone and more so, the high incidence of open fracture. The entire anteromedial part of shaft of the tibia is subcutaneous. The bone is, therefore, easily injured when exposed to trauma, as the soft tissue cover is minimal. Trauma remains the major aetiological factor for tibia fractures. It involves having an idea of the likely length of the intramedullary nail that would be inserted at the surgery. Different methods had been proposed, but none is 100% accurate[4-6]. Hence; the present study was undertaken for assessing the Proximal and Distal Dimensions of Tibia and Its Correlation with Length of Tibia.

Materials & Methods

The present study was undertaken in the department of human anatomy with the aim of assessing the Proximal and Distal

Dimensions of Tibia and Its Correlation with Length of Tibia. A total of 40 dry and processed tibias, irrespective of side, grossly normal and complete were obtained. Using a vernier caliper, measurements were taken on the bone. The length of tibia was defined as the vertical distance from the superior point on the medial tibial condyle to the inferior point on the medial malleolus. The following measurements were taken on the fibular incisura: Width of the fibular incisura, Depth of the fibular incisura, Height of the fibular incisura, Medial malleolus, Breadth of medial malleolus, Width of the tibial plafond, and Length of the tibial plafond. After obtaining the readings, all the findings were recorded in excel sheet and were subjected to correlative analysis.

Results

In the present study, a total of 40 Tibial specimens were analyzed. Average Length of tibia was 36.2 cm. average Width and length of tibial plafond was 2.8 cm and 3.2 cm respectively. Average Width and depth of fibula incisura was 2.2 cm and 0.6 cm respectively. Average Height of fibula incisura was 3.8 cm. Average height and breadth of medial malleolus 1.5 cm and 2.4 cm respectively. While analyzing the results through Pearson's correlation, it was seen that length of tibia was significantly correlated with depth of fibula incisura of both distal and proximal tibia.

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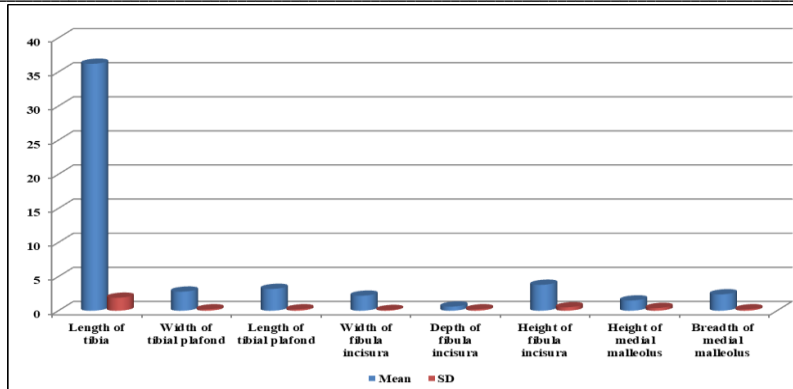


Fig 1: Anthropometric variables

Table 1: Correlation between length of tibia and distal tibial variables

Correlation of length of tibia with:	p- value (Pearson’s correlation)
Width of tibial plafond	0.98
Length of tibial plafond	0.42
Width of fibula incisura	0.39
Depth of fibula incisura	0.04
Height of fibula incisura	0.11
Height of medial malleolus	0.28
Breadth of medial malleolus	0.74

Table 2: Correlation between length of tibia and proximal tibial variables

Correlation of length of tibia with:	p- value (Pearson’s correlation)
Width of tibial plafond	0.43
Length of tibial plafond	0.29
Width of fibula incisura	0.62
Depth of fibula incisura	0.01
Height of fibula incisura	0.23
Height of medial malleolus	0.36
Breadth of medial malleolus	0.58

Discussion

The tibia is one of two bones that comprise the leg. As the weight-bearing bone, it is significantly larger and stronger than its counterpart, the fibula. The tibia forms the knee joint proximally with the femur and forms the ankle joint distally with the fibula and talus. The tibia runs medial to the fibula from just below the knee joint to the ankle joint and is connected to the fibula by the interosseous membrane. The proximal portion of the tibia consists of a medial and lateral condyle, which combine to form the inferior portion of the knee joint. Between the two condyles lies the intercondylar area, which is where the anterior collateral ligament, posterior collateral ligament, and menisci all have attachments. Bones differ from individual to individual on osteometric parameters that include the length of these bones due to hormonal differences, differential loading at joints and muscle bulk. These differences are clearly displayed in the long bones and have been used for stature estimation in forensic analysis[6-10]. Hence; the present study was undertaken for assessing the Proximal and Distal Dimensions of Tibia and Its Correlation with Length of Tibia.

In the present study, a total of 40 Tibial specimens were analyzed. Average Length of tibia was 36.2 cm. average Width and length of tibial plafond was 2.8 cm and 3.2 cm respectively. Average Width and depth of fibula incisura was 2.2 cm and 0.6 cm respectively. Average Height of fibula incisura was 3.8 cm. Fan L et al investigated the anatomic and morphologic features of the knees of the Southeastern Chinese population by magnetic resonance imaging (MRI) scans. A total of 245 knees from 244 Chinese adults (130 females and 114 males, aging from 18 to 89 years) who received knee MRI scan from November 2014 to October 2015 were recruited

and analyzed. A set of linear and angular parameters, and 6 normalized ratios were measured and calculated on the distal femur and proximal tibia. The knee size was significantly different between sexes. Compared with women, men have larger ($P < .01$) medial-lateral (ML) and anterior-posterior (AP) dimensions in both distal femur and proximal tibia. Differences in femoral shape, represented by the femur surface ratio, between both sexes were also identified (1.23 ± 0.07 vs 1.27 ± 0.07 , $P < .01$), whereas the ML/AP ratios of the tibia are similar between both sexes (1.44 ± 0.07 vs 1.44 ± 0.09 , $P = .97$). They also found substantial difference in the morphology of femur and tibia plateau in Southeastern Chinese population compared with data obtained from western populations[11].

In the present study, average height and breadth of medial malleolus was 1.5 cm and 2.4 cm respectively. While analyzing the results through Pearson’s correlation, it was seen that length of tibia was significantly correlated with depth of fibula incisura of both distal and proximal tibia. Kaloo RA et al determine correlation of length of tibia with dimensions of distal articular surfaces in North Indian population. 30 tibiae were obtained for the present study from the Department of Anatomy, SKIMS Medical College Srinagar. Measurements were taken from the bone using vernier calipers. Mean and standard deviation was measured for all the dimensions. Pearson’s correlation test was carried out for those dimensions that showed a linear association with the length of tibia. Moderate linear association was observed between length of tibia with the breadth of medial malleolus, height of fibular incisura and the length and width of tibial plafond. From the obtained data simple linear regression equations were deduced which would predict the expected maximum length of the bone[12].

Conclusion

From the above results, authors concluded that length of tibia was significantly correlated with depth of fibula incisura of both distal and proximal tibia.

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