



## MORPHOMETRIC STUDY OF PROXIMAL END OF TIBIA IN NORTH COASTAL ANDHRA PRADESH AND ITS CLINICAL IMPLICATION IN KNEE ARTHROPLASTY

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**ABSTRACT** Accurate Morphometric anatomical data of the upper end of tibia are very important to make design of total knee joint replacement prosthesis. Morphometric parameters of upper end of the tibia can be used to guide treatment and monitor outcome of total knee replacement surgeries. **MATERIALS & METHODS:** The study was conducted on 47 dry adult tibiae, obtained from Department of Anatomy GITAM Institutes of Medical Sciences and Research, Visakhapatnam. Out of total tibiae available, 47 (27 left and 20 right) were selected for the study. Measurements of medial and lateral condyles, intercondylar areas of upper end of tibia are recorded with the use of digital vernier calipers and were tabulated. **RESULTS:** We found that the mean AP and TD diameters of MTC are more than the AP and TD diameter of LTC. The measurements of MTC on both sides were significantly greater than LTC. The TTC area is greater in the right tibia when compared with the left tibia. **CONCLUSION:** This study provides a reliable database from which manufacturing of knee prostheses for the Indian population can be done with conclusive accuracy. The anatomic data collected in this study would be useful to the orthopedic surgeons, forensic experts and physical anthropologists as well.

**KEYWORDS :** Tibia, Medial Condyles, Lateral Condyles, Knee Arthroplasty

### INTRODUCTION

The knee joint is a complex synovial joint. It is essential for everyday activities such as standing, walking and climbing stairs and is also the main joint involved in running, jumping, kicking and changing directions. The knee joint is commonly affected by various forms of arthritis such as inflammatory and post traumatic arthritis of which osteoarthritis is the most common pathological condition being treated with interventional procedures such as TKA.

Prosthetic selection, accurate sizing and proper placement of the components determine the success of this procedure. Total knee arthroplasty is widely acknowledged to be one of the most successful and cost effective procedures in orthopedic practice.

Knee joint is a weight bearing joint and is susceptible to various pathological conditions. Knee osteoarthritis is most common and severe form of deformity related to ageing, genetic factors and mechanical forces, urban lifestyle and environmental changes of modernisation. Hence, the corrective knee surgeries have become frequent and demanding these days. An elaborate anatomical study of this area would help in planning required interventions in various pathological and degenerative conditions.

The aim of this study is to obtain data about upper end of tibia and facilitate designing of tibial component of prosthesis for replacement surgery.

### MATERIALS & METHODS

The study was conducted on 47 dry adult tibiae, obtained from Department of Anatomy GITAM Institutes of Medical Sciences and Research, Visakhapatnam. Out of total tibiae available, 47 (27 left and 20 right) were selected for the study. A total 12 parameters are measured by using digital vernier caliper.

#### Following parameters were measured.

**Anteroposterior length of the medial condyle(AB):** The distance between the most anterior points to most posterior point as straight line.

**Transverse length of the medial condyle(CD):** The distance from medial tubercle to medial margin of medial condyle.

**Anteroposterior length of the lateral condyle(EF):** It is measured from most anterior point to most posterior point as straight line.

**Transverse length of the lateral condyle(GH):** The distance from

lateral tubercle to lateral margin of lateral condyle.

**Antero-posterior length of Total Tibial Condyle(ST):** It is measured by a straight line passing exactly in the middle of medial and lateral tubercle of intercondylar eminence from most anterior to most posterior point.

**Transverse length of Total Tibial Condyle(UV):** It is measured by a straight line perpendicular to antero-posterior diameter from medial margin of medial condyle to lateral margin of lateral condyle.

#### Measurements of Intercondylar Area

- Anterior (IJ):** The maximum distance between most anterior points of intercondylar area to a line joining intercondylar eminence.
- Posterior(KL):** The maximum distance between a line joining intercondylar eminence and posterior border.

#### Transverse Diameter

- Anterior(MN):** It is measured by a straight line perpendicular to antero-posterior diameter at the anterior end.
- Middle(OP):** Straight line between medial and lateral tubercle.
- Posterior(QR):** It is measured by a straight line perpendicular to antero-posterior diameter at the posterior end.

#### Measurement of length from upper end to tibial tuberosity(WX)

### RESULTS

A total of forty seven tibiae were studied out of which twenty seven were of the left side and twenty were of the right side. Statistical analysis was carried out and various parameters thus obtained have been compared.

#### The following results were obtained

**Anteroposterior length of the medial condyle(AB):** The mean AP length of the medial condyle on the left side was 43.32 mm and on the right side was 44.25 mm.

**Transverse length of the medial condyle(CD):** The mean transverse length of the medial condyle on the left side was 27.20 mm and on the right side was 29.34 mm.

**Anteroposterior length of the lateral condyle(EF):** The mean AP length of the lateral condyle on the left side was 40.71 mm and on the right side was 41.31 mm.

**Transverse length of the lateral condyle(GH):** The mean transverse length of the lateral condyle on the left side was 25.34 mm and on the right side was 27.03 mm.

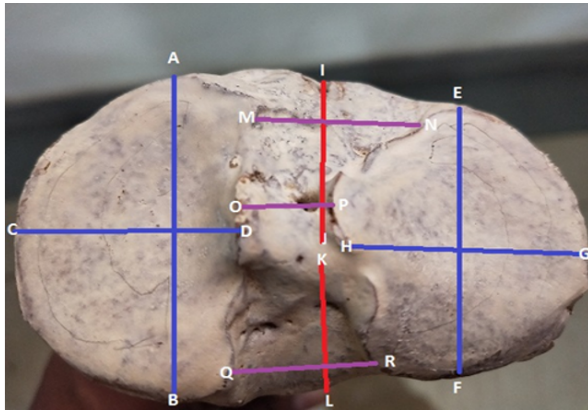


Figure:1



Figure: 2

**Antero-posterior length of Total Tibial Condyle(ST):** The mean AP length of the Total Tibial condyle on the left side was 44.89 mm and on

the right side was 45.05 mm.

**Transverse length of Total Tibial Condyle(UV):** The mean transverse length of the Total Tibial condyle on the left side was 61.67 mm and on the right side was 61.94 mm.

**Measurements of Intercondylar Area**

- a) **Anterior (IJ):** The mean of anterior part of intercondylar area on the left side was 19.62 mm and on the right side was 20.04 mm.
- b) **Posterior(KL):** The mean of posterior part of intercondylar area on the left side was 18.63 mm and on the right side was 19.73 mm.

**Transverse Diameter**

- a) **Anterior(MN):** The mean of anterior part of transverse length of intercondylar area on the left side was 21.90 mm and on the right side was 23.65 mm.
- b) **Middle(OP):** The mean between medial and lateral tubercle of intercondylar area on the left side was 7.95 mm and on the right side was 8.24 mm.
- c) **Posterior(QR):** The mean of posterior part of transverse length of intercondylar area on the left side was 10.21mm and on the right side was 9.80 mm.

**Measurement of length from upper end to tibial tuberosity(WX):** The mean length from the upper end of tibia to the tibial tuberosity on the left side was 41.96 mm and on the right side was 40.81 mm.

**DISCUSSION**

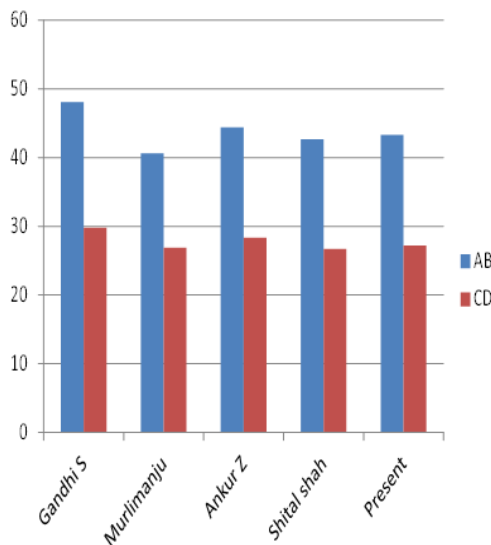
This study provides the complete information about all the dimensions of upper end of tibia. From the above result, the TTC area is greater in the right tibia when compared with the left tibia. The mean area of MTC of the right tibia is greater than the mean area of MTC of the left tibia, and also the mean area of LTC of the right tibia is greater than the area of LTC on the left tibia.

A comparison of measurements of various studies has been done with the present study to have a better understanding changing trends.

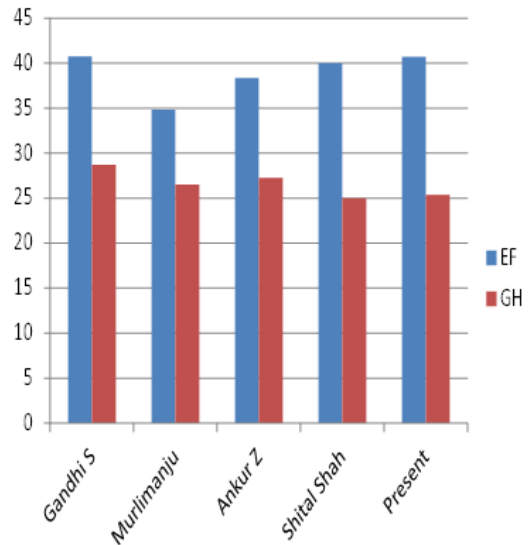
The Anteroposterior diameter of the medial condyle (AB) in the present study was found to be 43.32 while in the Gandhi S et al., it was found from 48.09mm. Transverse diameter of the medial condyle (CD) in the present study was found to be 27.20 while in the other studies it was found from 26.70 to 29.78mm.

**Comparison of different parameters of proximal end of tibia among various studies**

Various studies & year	Anteroposterior length of the medial condyle (AB)	Transverse length of the medial condyle(CD)	Anteroposterior length of the lateral condyle(EF)	Transverse length of the lateral condyle(GH)
1.Gandhi S et al., 2014	48.09 mm	29.78 mm	40.76 mm	28.72 mm
2.Murlimanju BV et al., 2016	40.60 mm	26.90 mm	34.80 mm	26.50 mm
3.AnkurZ Zalawadia et al.,2018	44.43 mm	28.32 mm	38.38 mm	27.26 mm
4. Shital Shah et al.,2018	42.70 mm	26.70 mm	40.00 mm	25.00 mm
5. Present study	43.32 mm	27.20 mm	40.71 mm	25.34 mm



Medial Condyle Anteroposterior and Transverse length by various studies



Lateral Condyle Anteroposterior and Transverse length by various studies

The Anteroposterior diameter of the lateral condyle (EF) in the present study was found to be 40.71 while in the other studies it was found from 34.80 to 40.76. Transverse diameter of the lateral condyle (GH) in the present study was found to be 25.34 while in the other studies it was found from 25.00 to 28.72mm.

The Anteroposterior length of the Total Tibial Condyle (ST) in the present study was found to be 44.89 while in the other studies it was found from 43.72 to 49.11mm. Transverse diameter of the Total Tibial Condyle (UV) in the present study was found to be 61.67 while in the other studies it was found 66.68mm.

The mean length from the upper end of tibia to the tibial tuberosity on the left side was 41.96 mm and on the right side was 40.81 mm. while in the Angela Soosanivan studies it was found from 44.78 to 46.05mm.

## CONCLUSION

This study provides a reliable database from which manufacturing of knee prostheses for the Indian population can be done with conclusive accuracy. The anatomic data collected in this study would be useful to the orthopedic surgeons, forensic experts and physical anthropologists as well.

## REFERENCES

1. Angela Soosanivan., Morphometric Study of Proximal End of Tibia' 2014
2. Bhadoria Pooja, Pangtey Babita, Mishra Sabita., Morphometric Study of Proximal End of Tibia With Its Clinical Implications In North Indian Population., J. Evolution Med. Dent. Sci, Vol. 7/ Issue 23/ June 04, 2018
3. Gandhi S, Singla RK, Kullar JS, Suri RK, Mehta V. Morphometric analysis of upper end of tibia. *Journal of Clinical & Diagnostic Research* 2014; 8(8): 10-13.
4. Gray's Anatomy. The Anatomical Basis of Clinical Practice. 39th [2] Edition, Elsevier Churchill Livingstone. 2005. Pp: 1436-37.
5. Murlimanju BV, Purushothama C, Srivastava A, Kumar CG, Krishnamurthy A, Blossom V, et al. Anatomical morphometry of the tibial plateau in South Indian Population. *Italian Journal of Anatomy and Embryology*. 2016; 121(3):258-64.
6. Shital Shah, Kanan Shah et al A Morphometric Study of the Proximal End of the Tibia in State of Gujarat., *Sch. J. App. Med. Sci.*, Feb 2018; 6(2): 544-547
7. Zalawadia AZ, Patel SM. Morphometric study of upper end of tibia in Gujarat region and its clinical implication in knee arthroplasty. *Int J Anat Res* 2018; 6: 4871-5.