

A Morphometric Study of the Proximal End of the Tibia in State of Gujarat

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Abstract: The importance of the measurements and the variations in measurements across different populations lies in designing of implants for Total Knee Replacement (TKR) surgery. 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. The study was conducted on 300 tibias all measurements were recorded with the help of Vernier calipers. Anteroposterior diameter of the medial condyle (YZ) in the present study was found to be 42.70 ± 3.80 while in the other studies it was found from 40.60 ± 3.90 to 48.09 ± 4.26 . Transverse diameter of the medial condyle (WX) in the present study was found to be 26.70 ± 3.00 while in the other studies it was found from 26.90 ± 2.90 to 29.78 ± 2.99 . Anteroposterior diameter of the lateral condyle (UV) in the present study was found to be 40.00 ± 3.30 while in the other studies it was found from 34.80 ± 3.90 to 40.76 ± 4.05 . Transverse diameter of the lateral condyle (ST) in the present study was found to be 25.00 ± 3.00 while in the other studies it was found from 26.50 ± 3.40 to 28.72 ± 3.11 .

Keywords: Tibia, upper end of Tibia, arthroplasty.

INTRODUCTION

The knee joint is a compound synovial joint which brings out the significant function of adjusting the center of body mass and posture, requiring a great range of movement in three dimensions together with the capability to bear high forces [1].

The lower limb is primarily adapted for weight bearing and locomotion. This functional need alongwith together with the attainment of a habitual erect bipedal posture has resulted in a change in both the functional and mechanical requirements of all skeletal structures. Therefore greater strength and stability is required for the lower limb as compared with the upper limb [2].

As there is high incidence of obesity and worldwide the population is rapidly increasing towards old age, the incidences of osteoarthritis are increasing as well as need of partial as well as total knee replacement (TKR). Total knee replacement is very complex and accurate method considered beneficial for removing pain and improve the lifestyle of patients in severe case of osteoarthritis [3].

The importance of the measurements and the variations in measurements across different populations lies in designing of implants for Total Knee Replacement (TKR) surgery. Mismatch between the morphometric data and the prosthesis will give rise to various complications like post-operative pain, cruciate ligament tear, prosthesis loosening and displacement etc [4-6].

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 AND METHODS

The study was conducted on 300 tibias from Anatomy departments of Smt. NHL Municipal Medical College and BJ Medical College at Ahmedabad.

Damaged, incomplete and unossified bones were excluded. All bones-intact, fully ossified and belonging to adults were collected for study.

All measurements were recorded with the help of Vernier calipers.

Following parameters were measured.

- Anteroposterior diameter of the medial condyle(YZ)

- Transverse diameter of the medial condyle(WX)
 - Anteroposterior diameter of the lateral condyle(UV)
 - Transverse diameter of the lateral condyle(ST)
- The data obtained was statistically analysed.

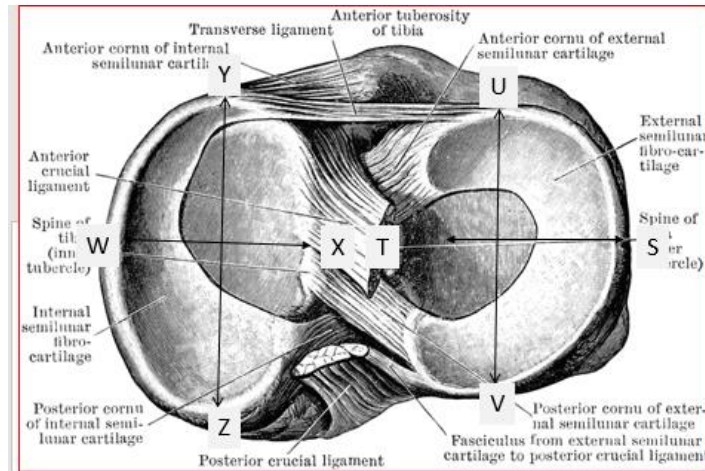


Fig-1: Schematic diagram showing various diameters
 Source- http://etc.usf.edu/clipart/55400/55425/55425_tibia.htm



Fig-2: Measurement of (i) Transverse diameter of medial condyle & (ii) Transverse diameter of lateral condyle

RESULTS

Table-1: Measurements of upper end of the tibia in mm

	Mean Length (mm)	SD	CV(%)
Anteroposterior diameter of the medial condyle(YZ)	42.7	± 3.8	8.89
Transverse diameter of the medial condyle(WX)	26.7	± 3.0	11.23
Anteroposterior diameter of the lateral condyle(UV)	40.0	± 3.3	2.58
Transverse diameter of the lateral condyle(ST)	25.0	± 3.0	12.00

DISCUSSION

All the measurements are in mm.

Table-2: Comparison of data from different studies

Sr. No	Study	Anteroposterior diameter of the medial condyle(YZ)	Transverse diameter of the medial condyle(WX)	Anteroposterior diameter of the lateral condyle(UV)	Transverse diameter of the lateral condyle(ST)
1	Present Study	42.70±3.80	26.70±3.00	40.00±3.30	25.00±3.00
2	Gandhi S <i>et al.</i> , [7]	48.09±4.26	29.78±2.99	40.76±4.05	28.72±3.11
3	Ankur Z Zalawadia <i>et al.</i> , [8]	44.43±2.06	28.32±3.88	38.38±2.39	27.26±1.92
4	Murlimanju BV <i>et al.</i> , [9]	40.60±3.90	26.90±2.90	34.80±3.90	26.50±3.40

The data obtained in various studies are summarized in Table-2 for easy comparison.

Anteroposterior diameter of the medial condyle (YZ) in the present study was found to be 42.70±3.80 while in the other studies it was found from 40.60±3.90 to 48.09±4.26.

Transverse diameter of the medial condyle (WX) in the present study was found to be 26.70±3.00 while in the other studies it was found from 26.90±2.90 to 29.78±2.99

Anteroposterior diameter of the lateral condyle (UV) in the present study was found to be 40.00±3.30 while in the other studies it was found from 34.80±3.90 to 40.76±4.05.

Transverse diameter of the lateral condyle (ST) in the present study was found to be 25.00±3.00 while in the other studies it was found from 26.50±3.40 to 28.72±3.11.

Knee osteoarthritis is one of the most common causes of disability in adults. The damage results from a complex interplay of joint integrity, biochemical processes, genetics and mechanical forces. Osteoarthritis is the most common indication for total knee arthroplasty. Total and unicompartmental joint replacements have become the gold standard for treatment of osteoarthritis and other degenerative disorders of knee [10].

Total knee arthroplasty and UKA are both meticulous surgeries which necessitate the precision in the prosthesis sizing to ensure an effective result as well as long term survival of the same. Suitable prosthetic design is crucial to restore the normal function in patients postoperatively. Inadequate tibial coverage can lead to tibial implant collapse because of the load being shifted to cancellous bone instead of cortical bone [11].

CONCLUSION

The prostheses for arthroplasty available are designed according to the studies done in European and

American population. The data obtained from this study and other studies done in Indian population will help to manufacture prostheses better suited to the Indian population and hence increase the effectiveness and the survival of the prostheses.

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