A DESCRIPTIVE STUDY OF MORPHOMETRIC DATA OF FEMORAL CONDYLES BY DIRECT METHOD TO DETERMINE DIFFERENCE ON RIGHT & LEFT SIDE IN RAJASTHAN REGION

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Abstract

Background: There are no published studies on the anthropometry of the distal femur in the Indian population. Hence the results obtained from this study would provide valuable data on the average dimensions of the distal femur which can serve as guidelines for designing a suitable femoral component of total knee prostheses for this population.

Methods: After applying inclusion and exclusion criteria 41 dried femur of each side (total 82) of unknown age and sex will be selected for present study. The maximum anteroposterior distance & maximum transverse distance of lateral femoral condyle, maximum anteroposterior distance & maximum transverse distance of medial femoral condyle width was measured.

Results: In the present study the mean AP diameter of the medial condyle on right side was 54.55 ± 6.88 mm and on left side was 54.36 ± 3.56 mm, The mean Transverse diameter of the medial condyle was 27.33 ± 3.09 mm and 25.03 ± 1.99 mm on right and left side respectively. In AP diameter parameters no statistically significant difference found between right and left side because p value was $> .05$ for both parameters. But in Transverse diameter parameters are statistically significant found between right and left side because p value was $< .05$.

Conclusion: On comparison between right and left side measurements, no significant difference was found between values of parameters of right and left sided femur. This information will be useful to negate the need of side specific measurements for implant

Keywords: Femur, left, Right

Introduction

The lower limbs are the principle organ of locomotion and support the entire upper body weight. To fulfill both of these functions satisfactorily and for maintaining the strength and stability, bones of lower limb become more robust in comparison of upper limb and corresponding joints also become stronger and more stable.¹

The femur is the long bone of the lower extremity. It shows wide range of modifications in its architecture. Femur is susceptible to the functional hormonal disturbances in female, aging process and physical traumas which make femur fragile which account for its usual fractures and dislocations. The bone is highly vascular structure with unique features in its blood supply.² The distal end of femur has generous blood supply by branches of popliteal artery. It is so abundant that it seems unlikely for any fracture here could cause necrosis.³

There are no published studies on the anthropometry of the distal femur in the Indian population. Hence the results obtained from this study would provide valuable data on the average dimensions of the distal femur which can serve as guidelines for designing a suitable femoral component of total knee prostheses for this population.

Material and Methods

Study Place – Department of Anatomy, S.M.S. Medical College, Jaipur

Study Period – From approval of plan till 15 December 2020.

Study Type – Descriptive type of observational study.

Study Design – Cross-sectional study.

Sample Size – Sample size calculated at 95% confidence level and alpha-error of 0.05 expecting standard deviation of 3.17 mm in the mean inter condylar notch with of right and left side of femur as per result of seed article :- HIREN S. CHAVDA¹, HISHITA K JETHVA², SUDARSHAN GUPTA³ A Study of Morphometric Analysis of Condyles of Adult Dry Femur of Humans in Gujarat Region. DOI: 10.7860/IJARS/2019/40703:2474

To detect mean difference of at least 2mm in the mean intercondylar notch at the study power of 80% the required sample size would be 41 adult dry femur bone for each side.

Method

After applying inclusion and exclusion criteria 41 dried femur of each side (total 82) of unknown age and sex will be selected for present study. The bicondylar width, maximum anteroposterior distance & maximum transverse distance of lateral femoral condyle, maximum anteroposterior distance & maximum transverse distance of medial femoral condyle and inter condylar notch width will be measured.

All the measurements was performed by using digital vernier caliper. The femur will be clamped to facilitate the measurements.

The measurement will be taken by me on 3 occasions and the average of the 3 values will be taken as representative measure. The intra observer variation will be minimized by taking the measurement 3 times. The data will be tabulated and analyzed statistically.

Eligibility criteria-

Inclusion Criteria –Fully ossified Dried, intact bones of unknown sex and age.

Exclusion Criteria –incomplete bone showing damage, bone deformity and gross pathological changes (like Arthritic changes).

Statistical Analysis

Statistical analysis was performed with the SPSS, version 21 for windows statistical software package (SPSS inc., Chicago, IL, USA). The categorical data was presented as numbers (percent) and were compared among groups using Chi square test. The quantitative data was presented as mean and standard deviation and were compared by student t-test. Probability was considered to be significant if less than 0.05.

Observation and Result

A total of 82 dry human cadaveric tibia used for present study, out of which 41 were from right side and 41 were from left side. Statistical analysis was carried out and obtained results of various parameters have been compared in tables and histograms accordingly. Following results were obtained-

Table 1: Lateral Condyle Anteroposterior Diameter (LC AP) in mm

	Right Side		Left Side	
	Mean	SD	Mean	SD
LC AP (in mm)	58.15	3.27	57.79	3.17
Median	58.42		57.36	
P value	0.579 (NS)			

Table 2: Lateral Condyle Transvers Diameter (LC T) in mm

	Right Side		Left Side	
	Mean	SD	Mean	SD
LC T(in mm)	28.53	2.92	28.63	3.23
Median	28.03		28.15	
P value	0.875 (NS)			

Table 3: Medial Condyle Antero Posterior Diameter (MC AP) in mm

	Right Side		Left Side	
	Mean	SD	Mean	SD
LC AP (in mm)	54.55	6.88	54.36	3.56
Median	56.49		54.70	
P value	0.872 (NS)			

Table 4: Medial Condyle Transvers Diameter MC T(in mm)

	Right Side		Left Side	
	Mean	SD	Mean	SD
MC T(in mm)	27.33	3.09	25.03	1.99
Median	27.87		25.13	
P value	P<0.001 (S)			

Discussion

Total knee arthroplasty and unicompartmental knee arthroplasty are both precision surgeries which require accuracy in the prosthesis sizing to ensure a successful outcome as well as long term survival of the same. Appropriate prosthetic design is essential to restore as much normal function in patients as possible post operatively.⁵⁶ Insufficient tibial coverage can lead to tibial implant collapse because of the load being transferred to cancellous bone instead of cortical bone.⁵⁷ As most of the conventional prostheses available in the market are designed for Caucasians, Indians having smaller anatomical profiles would need smaller sized components of knee prosthesis.

As there are no published studies on the morphometric measurements of the distal end of femur in the Rajasthan population, the present study was carried out to measure various parameters of the distal end of femur which would provide data for sizing of tibial component in UKA and TKA prosthesis in Rajasthan population.

In the present study the mean AP diameter of the medial condyle on right side was 54.55±6.88 mm and on left side was 54.36±3.56 mm, . The mean Transverse diameter of the medial condyle was 27.33±3.09 mm and 25.03±1.99 mm on right and left side respectively. In AP diameter parameters no statistically significant difference found between right and left side because p value was >.05 for both parameters. But in Transverse diameter parameters are statistically significant found between right and left side because p value was <.05.

Table 5: Comparison of Mean AP and Mean Transverse diameter of Medial Condyle among various studies

Study	Mean AP diameter (mm)		Mean Transverse diameter (mm)	
Chavda et al	53.71±4.56		26.79±2.16	
	Right	Left	Right	Left
Fatih Yazar et al	57±4.71	57±4.71	24.61±2.58	24.61±2.57
Ioannis Terzidis et al	58.6±4.1	58.6±4.1	-	-
Synnapu U.R et al	56.64±4.8	58.02±5.3	29.74±4.74	28.90±3.13
Rajan M et al	56.62±4.19	57.14±4.82	22.64±3.96	23.12±2.17
Present study	54.55± 6.88	54.36±3.56	27.33±3.09	25.03±1.99

In the present study the mean AP diameter of lateral condyle on right side was 58.15±3.27 mm and on left side was 57.79±3.17 mm. The mean Transverse diameter of the lateral condyle was 28.53±2.92 mm and 28.63±3.23 mm on right and left side respectively. In both of these parameters no statistically significant difference found between right and left side because p value was >.05 for both parameters.

Table 6: Comparison of Mean AP and Mean Transverse diameter of Lateral condyle among various studies

Study	Mean AP diameter (mm)		Mean Transverse diameter (mm)	
Chavda et al	54.87±4.13		29.93±2.58	
	Right	Left	Right	Left
Fatih Yazar et al	60.94±4.5	60.94±4.5	23.61±2.18	23.61±2.18
Ioannis Terzidis et al	58.4±4.0	58.5±4.0	-	-
Synnapu U.R et al	57.40±4.5	59.30±4.2	30.26±4.0	30.72±2.9
Rajan M et al	58.52±3.44	56.92±3.41	22.86±3.12	23.1±2.34
Present study	58.15±3.27	57.79±3.17	28.53±2.92	28.63±3.23

Figure 1: Showing measurement of Maximum anteroposterior distance of lateral femoral condyle (LC AP) **Figure 2: Showing measurement of Maximum anteroposterior distance of medial femoral condyle (MC AP)** **Figure 3: Showing measurement of Maximum transverse distance of medial femoral condyle (MC T)** **Figure 4: Showing measurement of Maximum transverse distance of lateral femoral condyle (LC T)**

Conclusion

On comparison between right and left side measurements, no significant difference was found between values of parameters of right and left sided femur. This information will be useful to negate the need of side specific measurements for implant

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