



Morphometric Study of Tibial Condylar area in the North Indian Population.

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Abstract:

The upper end of tibia is expanded to form a mass that consists of two parts: lateral and medial condyles which articulate with the corresponding condylar surfaces of the femur. Separating these two condyles is the intercondylar area whose central part is raised to form the intercondylar eminence. The present study will give information of the exact dimensions and percentage covered by medial and lateral condyles out of total condylar area. This study was undertaken to collect metrical data about the medial and lateral condyles of tibia. The present study was performed on 150 dry tibia of north Indian subjects, Out of which 70 tibia belonged to right side and 80 were of left side. The age and sex of these bones were not known. The anteroposterior length of medial and lateral tibial condylar area was measured along with their transverse diameter. The data was statistically analyzed to hold comparisons between tibia of right and left side and also between medial and lateral tibial condyles of the same side. The area covered by MTC is 38.56% and by LTC is 35.97% out of total condylar area in right side. The area covered by MTC is 37.32% and by LTC is 35.65% out of total conylar area in the left side. The study is important for anatomists, anthropologists, and orthopedics regarding unicompartmental knee arthroplasty (UKA), complete knee arthroplasty procedures and meniscal transplantation.

Keywords: tibia, medial tibial condyle, lateral tibial condyle, intercondylar area.

Introduction

The upper end of tibia expanded to form a mass that consists of two parts: lateral and medial condyles which articulate corresponding surface of femur. The articular surfaces are covered by hyaline cartilage. Separating these two condyles is the intercondylar area whose central part is raised to form intercondylar eminence having medial and lateral tubercles. The medial condyle is larger, ovoid and lateral condyle is small and circular. It was reported that the morphology of medial tibial plateau differs from lateral tibial plateau.[1]. There are few studies which have analyzed the correlation between tibial anatomy and implant design.[2,3]. The dimension of each condyle is requisite for planning the unicompartmental knee arthroplasty.

Aims and Objective

The present study will enhance the anatomical information for teaching (the exact dimensions and percentage covered by medial and lateral condyles) which is the primary information for unicompartmental knee arthroplasty and complete knee arthroplasty. The study is also important for orthopaedician for unicompartmental knee arthroplasty and complete knee arthroplasty for preventing the loosening of knee prosthesis.[4].

Material and method

For the present study 150 dry tibia were studied out of which 70 tibia belong to right side and 80 were of left side. The age and sex of those bones were not known.

The measurements (anteroposterior and transverse diameter of medial tibial condyle, lateral tibial condyle and total tibial condyle)

were taken by manual vernier calipers. The measurements were repeatedly taken for each bone to ensure the accuracy.

In Fig 1. The anteroposterior diameter of medial tibial condyle has been measured from most anterior point (exactly posteromedial to the attachment of anterior horn of medial meniscus) to most posterior point as straight line. Transverse diameter is measured perpendicular to anteroposterior diameter from medial tubercle to medial margin of medial condyle as straight.

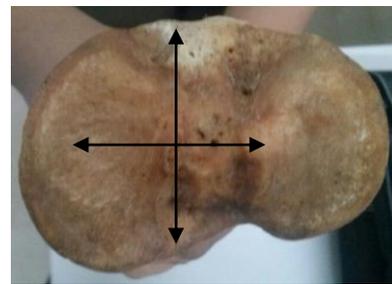


Fig no. 1

In Fig 2. The anteroposterior diameter of lateral tibial condyle is measured from most anterior point (just lateral to the attachment of anterior horn of lateral meniscus) to most posterior point as straight line. Transverse diameter is measured perpendicular to anteroposterior diameter from lateral tubercle to lateral margin of lateral condyle as straight line.

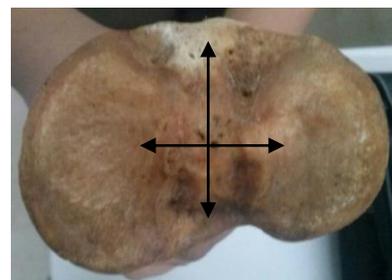


Fig.no 2

In Fig 3. The anteroposterior diameter of total tibial condyle is showed by a straight line passes exact middle of medial and lateral tubercle of intercondylar eminence from most anterior to most posterior point. Transverse diameter is perpendicular, showed by a straight line passes along the medial tubercle from medial margin of medial condyle to lateral margin of lateral condyle.

All these measurements were maximum on these points.

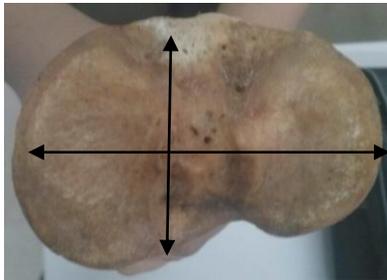


Fig no. 3

Ethics

The study has been done on dry tibia, there was no involvement of patient and animal.

Observation

After taking measurements of MTC,LTC and TTC: the area of each bone is calculated.

Area of condyle= AP × TD of condyle

All the area have been statistically analyzed and mean has been calculated for areas of medial condyle, lateral condyle and total tibial condyle.

The mean of AP and TD of medial condyle and lateral condyle is also calculated.

The percentage has been calculated of medial and lateral condyle area out of total tibial condylar area.

Result

The area covered by MTC is 38.56% and by LTC is 35.97% out of total condylar area in right side. The area covered by MTC is 37.32% and by LTC is 35.65% out of total conylar area in the left side.

Discussion

The present study establishes the exact value for the various parameters of medial and lateral tibial condyle. Since the total tibial condylar area mean is little more on right side. The AP diameter of MTC is more than LTC in both side of tibia[1]. The AP diameter is more in the left side of MTC whereas the TD is more in MTC on right side. The AP and TD of LTC is somewhat same in right and left side both. The area of MTC and LTC both are more in the right side.

It was reported that parameters differs from medial and lateral compartment so this study has reported the morphometry of tibial plateau area and compared them statistically. In clinical practice, surgeons do not favor implants with insufficient tibial coverage as this induces the possibility of tibial implant collapse.[4,5].

The study will provide guidelines for designing appropriate tibial unicompartmental knee arthroplasty and complete knee arthroplasty component because few studies in which the failure of UKA occurred due to implant loosening. The present study will also give the morphometrical information to anatomist and anthropologist and very important, the students. The study will be very useful for medical students who will get the exact measurements of tibial

condyle which is very important while doing knee transplant.

Conclusion

The medial tibial condyle occupies about 37-38% of total tibial condylar area while lateral tibial condyle occupies about 35%. The study is giving morphometrical information to anatomist & anthropologist.

The study may provide guidelines for designing appropriate tibial unicompartmental knee arthroplasty & complete knee arthroplasty

component because few studies in which the failure of UKA occurred due to implant loosening. [4].

Acknowledgment

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Table no. 1: comparison among MTC, LTC & total tibial condylar area.

Side of tibia	Total tibial condylar area mean	Medial tibial condyle				Lateral tibial condyle			
		Mean AP	Mean trans.	Mean area	%	Mean AP	Mean trans.	Mean area	%
Right side (70)	2988.73	38.63	29.73	1152.52	38.56	36.47	29.21	1075	35.97
Left side (80)	2951.44	39.94	27.5	1101.77	37.32	36.94	29.77	1052	35.65

- All the measurements have been taken in mm.
- Abbreviations: MTC- medial tibial condyle, LTC- lateral tibial condyle, TTC- total tibial condyle, AP – anteroposterior, TD- transverse diameter, UKA- unicompartmental knee arthroplasty.

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