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|  <p>ISSN NO. 2320-5407</p> | <p>Journal Homepage: - www.journalijar.com</p> <p>INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)</p> <p>Article DOI: 10.21474/IJAR01/12744 DOI URL: http://dx.doi.org/10.21474/IJAR01/12744</p> |  <p>INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR) ISSN 2320-5407</p> <p>Journal Homepage: http://www.journalijar.com Journal DOI: 10.21474/IJAR01</p> |
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RESEARCH ARTICLE

MORPHOMETRIC ASSESSMENT OF FEMORAL CONDYLAR PARAMETERS IN GUJARAT REGION AND ITS CLINICAL RELEVANCE : AN OSTEOLOGICAL STUDY

Abhinav Kumar Mishra¹, Achaleshwar Gandotra², Gyan Prakash Mishra³, Navneet Kumar⁴ and Pawan Kumar Dubey⁵

1. PhD Scholar, Department of Anatomy, SBKSMIRC, Sumandeep Vidyapeeth Deemed to be University.
2. Professor & HOD, Department of Anatomy, SBKSMIRC, Sumandeep Vidyapeeth Deemed to be University.
3. Professor & HOD, Department of Anatomy, MVASMC, Basti.
4. Principal, MVASMC, Basti.
5. Statistician cum Tutor, Department of Community Medicine, MVASMC, Basti.

Manuscript Info

Manuscript History

Received: 10 February 2021
Final Accepted: 16 March 2021
Published: April 2021

Key words:-

Intercondylar Notch, Intercondylar Notch Index, Stenosis, Cruciate Ligament, Patella-Femoral Groove

Abstract

The Femur is the longest and strongest bone of the lower limb in which there is a groove present on anterior side and a notch present on posterior side. The anterior groove is called as patella-femoral groove and posterior notch is called Intercondylar (IC) Notch. There are two most important ligaments are connected with notch called Anterior Cruciate Ligament (ACL) and Posterior Cruciate Ligament (PCL), associated by embryological and cognitive to the notch. The aim of this study is to find out the condylar parameters of femur. We obtained 50 completely ossified dry femur of both sides from Department of Anatomy, SBKSMIRC, Sumandeep Vidyapeeth. The Mean \pm SD of femoral parameters were measured and correlation were also calculated between various parameters which is found to be positively correlated. It guides to the anatomists as well as Orthopaedicians and forensic practices also.

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Introduction:-

Femur is the strongest bone of the lower limb which has two condyles in its lower end. There is a groove present anteriorly and a notch present posteriorly. The anterior groove is called as patella-femoral groove and posterior notch is referred as Intercondylar (IC) Notch¹ within it the most important ligaments are adhered, called Anterior Cruciate Ligament (ACL) and Posterior Cruciate Ligament (PCL)² which are associated by embryological and cognitive to the notch³.

The study of the notch is clinically important because there is a risk of ligament tearing by the narrowing of this notch^{4, 5}. It was observed that the width of IC notch found to be tapered in women^{6,7,8} while another findings^{9,10} concluded to its adverse. The ratio of the width of IC notch and the width of the distal femur is called as Notch Width Index (NWI)⁵ which was recorded that smaller the NWI can lead to the higher incidence of injury of ACL¹¹. According to some authorities, there is no findings of sexual dimorphism found in its NWI^{10,12,13}.

Corresponding Author:- Pawan Kumar Dubey

Address:- Statistician cum Tutor, Department of Community Medicine, MVASMC, Basti.

Material And Methods:-

The study was carried out on 50 completely ossified dry human femora obtained from Department of Anatomy, SBKSMIRC, Sumandeep Vidyapeeth Deemed to be University, Vadodara, Gujarat. The sampling technique used for collection of data was simple random sampling and performed the observational type of study design. Partially or Un-ossified and damaged femora were excluded from the study. The parameters were observed twice in this study. The measurements of IC distance were taken from the maximum point of the condyles and the IC notch distance from inner maximum distance. All the measurements were taken by Digital caliper and measuring tape.



Fig 1:- Measurements of Intercondylar



Fig 2:- Measurements of Intercondylar Distance Notch Distance.

Observations And Result:-

Table 1:- Descriptive statistics of Femoral Parameters.

| Parameters | Sides | Mean | SD |
|-------------------|---------|-------|------|
| Length of Femur | Rt (cm) | 38.50 | 2.10 |
| | Lt (cm) | 38.59 | 2.10 |
| IC Distance | Rt (mm) | 68.74 | 7.30 |
| | Lt (mm) | 68.78 | 4.59 |
| IC Notch Distance | Rt (mm) | 17.44 | 3.30 |
| | Lt (mm) | 17.92 | 1.93 |

In Table 1. showing the Mean \pm SD of both right and left side of Length of the femur found to be 38.50 ± 2.10 and 38.59 ± 2.10 respectively. The Mean \pm SD of IC distance and IC Notch distance of right side were calculated as 68.74 ± 7.30 and 17.44 ± 3.30 while its left side was measured as 68.78 ± 4.59 and 17.92 ± 1.93 respectively.

Table 2:- Parameters of Notch Width Index.

| Sides of Femur | Mean \pm SD |
|----------------|------------------|
| Right | 0.255 ± 0.04 |
| Left | 0.283 ± 0.04 |

In Table 2. showing the Mean \pm SD of NWI measured in right femora was 0.255 ± 0.04 while in left femora it was calculated as 0.283 ± 0.04 .

Table 3:- Correlation between Femoral Parameters.

| Correlation | | |
|--|-------------------------|-------|
| Length of Right Femur Vs.IC Distance of Right Femur | Correlation Coefficient | 0.278 |
| | Significant Value | 0.05 |
| | N | 50 |
| Length of Left Femur Vs.IC Distance of Left Femur | Correlation Coefficient | 0.499 |
| | Significant Value | 0.00 |
| | N | 50 |
| IC Distance of Right Femur Vs.IC Notch Distance of Right Femur | Correlation Coefficient | 0.455 |
| | Significant Value | 0.00 |
| | N | 50 |
| IC Distance of Left Femur Vs.IC Notch Distance of Left Femur | Correlation Coefficient | 0.368 |
| | Significant Value | 0.00 |
| | N | 50 |

All the femoral parameters showing positive correlation and are coming out to be significant as shown in the Table3.

Discussion:-

Morphometric study of Intercondylar Distance and Intercondylar Notch distance along with Notch Width Index is the most important anatomical tool which is used as recognition of the availability for ACL attachment space. There is well-built interrelation between the stenosis of IC notch and high incidence ACL damage in osteoarthritic knee¹⁴.

Table 4:- Comparison of NWI with previous studies.

| Authors | Notch Width Index (NWI) |
|---|---------------------------------|
| | Mean \pm SD |
| Souryal & Freeman (1993)¹⁵ | 0.231 \pm 0.04 |
| Ravichandran and Melani (2010)¹⁶ | 0.252 \pm 0.04 |
| Ameet K.J. & Murlimanju B.V. (2014)¹⁷ | 0.250 \pm 0.04 |
| Present study (2021) | 0.255 \pm 0.04 |

The present study provides valuable data pertaining to the femoral parameters. In this study effort has been made to find the correlation and clinical findings about the condyles and its notch.

Our study is showing some similarities from the study done by Ravichandran et al. same study has been conducted by Ameet K.J. and Murlimanju B.V. and found the similar mean values whereas a study done by Souryal and Freeman which is less frequent than the present study.

Conclusion:-

The present study is useful tool as guide to the Orthopaedicians which helps in predicting the ACL injury in stenotic notch. This study shown that there is significant relationship between all the parameters were taken in this study and also helps in sex determination.

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