International Journal of Anatomy and Research,
Int J Anat Res 2014, Vol 2(4):630-32. ISSN 2321- 4287
DOI: 10.16965/ijar.2014.511

Original Article

ANTHROPOMETRIC STUDY OF FEMUR IN SOUTH INDIA

Shakil Mohamad Khan [1], Shaik Hussain Saheb *[2].

[1]Assistant Professor, Department of Orthopedics, JJM Medical College, Davangere, Karnataka, India
*[2] Assistant Professor, Department of Anatomy, JJM Medical College, Davangere, Karnataka, India.

ABSTRACT

Background: Anthropometry provides scientific method and technique for taking various measurements in different geographic regions and races. The femur is the weight bearing typical long bone of lower limb which extends from the pelvis to the knee. The anatomical knowledge of different dimensions of femur specially head and neck of the femur is very essential in anthropological and medico-legal practice for sex determination and as well as to radiologists, rheumatologists and orthopaedic surgeons for diagnosis and planning of treatment.
Objectives: The objectives of present study to find out the measurements of Platymeric index,Robusticity index and Foraminal index.
Materials and Methods: In present study have used 250 femurs from different colleges in south India. The following measurements were conducted Platymeric index, Robusticity index and Foraminal index for both right and left femur.
Results: The results of present study are the Physiological length of left femur was 44.15±2.35 and right was 43.98±2.15, the Rubusticity index of left femur was 15.26±1.17 and right was 14.34±1.21the Platymetric index of left femur was 85.70±6.35 and right was 86.32±6.15, the Foraminal index of left femur was between 37-65% and right was 35-62%.
Conclusion: The present study shows that there is significance different in between right and left femurs measurements. The anatomical knowledge of different dimensions of femur is very essential in anthropological and medico-legal practice for sex determination and as well as to radiologists, rheumatologists and orthopedic surgeons for diagnosis and planning of treatment.
KEY WORDS: Platymeric index, Robusticity index, Foraminal index, Femur.

Address for Correspondence: Shaik Hussain Saheb, Assistant Professor, Department of Anatomy, JJM Medical College, Davangere, Karnataka - 577004, India. **E-Mail:** anatomyshs@gmail.com

Access this Article online

Quick Response code

DOI: 10.16965/ijar.2014.511

Web site: International Journal of Anatomy and Research
ISSN 2321-4287
www.ijmhr.org/ijar.htm

Received: 10 Oct 2014
Peer Review: 10 Oct 2014 Published (O):31 Oct 2014
Accepted: 15 Oct 2014 Published (P):31 Dec 2014

INTRODUCTION

The femur is the weight bearing typical long bone of lower limb which extends from the pelvis to the knee. The anatomical knowledge of different dimensions of femur very essential in anthropological and medico-legal practice for sex determination and as well as to radiologists, rheumatologists and orthopaedic surgeons for diagnosis and planning of treatment[1]. The femur is the longest and strongest bone of the human body. Morphologically it is a typical long bone. The upper part of the femur forms the hip joint with the pelvis and the lower part of the femur forms the knee joint with the tibia[2]. It forms the skeleton of the thigh, bears body weight in erect posture, supports movement of legs, provides attachment to muscles, form blood cells and acts as store house for calcium and phosphate[3]. Identification of skeletal remains is one of the most difficult skills in forensic medicine. Sex determination is also important in identification. When the skeleton exists completely, sex can be determined with 100% accuracy[4].

The morphology of proximal femur is an essential parameter in the design and development of implant for total hip replacement. Inappropriate implant design and size could affect outcome of the surgery with reported complications such as stress shielding, micro motion and loosening. Most of these implants were designed and manufactured from the European and North American region which presumably based on the morphology of their respective population. The use of such implants in other regions such as Malaysia may not be appropriate as the design may not take into consideration the morphology of the local population[5].

The use of implants designed based on other populations posed at least two potential major issues. First and foremost is the difference of the anthropometry of the proximal femur between ethnics due to differences in lifestyle, physique, applied force and their distribution. This can be seen from numerous data presented in various studies for the western and eastern population. Another issue is implant-morphology mismatch that might cause difficulties during implant placement and could lead to accelerated deterioration of the implant life thus affecting short-term and long-term outcome of the surgery[6,7,8,9,10].

The main objectives of our study were to find out the measurements of Platymeric index, Robusticity index and Foraminal index. Following formulas are used for this study.

Sagittal Diameter of Middle of Shaft: It measures the distance between the anterior and posterior surfaces of the bone, approximately at the middle of the Shaft i.e., the most prominent part of the linea aspera or two points farthest apart in sagittal plane at mid-shaft.

Transverse Diameter of Middle of Shaft: It measures the distance between the margins of the bone at right angle to sagittal Diameter of the middle of the shaft or two points farthest apart in coronal plane at mid-shaft.

Physiological Length / Oblique Length: It measure the projective distance between the highest point of the head and the tangent to the lower surface of the two condyles.

$$\text{Robusticity Index} = \frac{\text{Sagittal Diameter of Middle of Shaft} + \text{Transverse Diameter of Middle of Shaft X 100}}{\text{Physiological Length}}$$

$$\text{Robusticity Index} = \frac{\text{Upper Sagittal Diameter of Shaft X 100}}{\text{Upper Transverse Diameter of Shaft}}$$

Upper Transverse diameter of shaft / Subtrochanteric Sagittal Diameter : It measures the the transverse diameter of the upper end of the shaft, where it shows maximum lateral projection. When the projection is not clear, this measurement is taken 2.5cm below the base of lesser trochanter. Transverse plane is to be understood with regard to upper epiphysis.

Upper Sagittal Diameter of Shaft: It measures the antero-posterior diameter of the upper shaft taken at right angle to the upper transverse diameter of shaft. The anatomical knowledge of different dimensions of femur is very essential in anthropological and medico-legal practice for sex determination and as well as to radiologists, rheumatologists and orthopedic surgeons for diagnosis and planning of treatment.

MATERIALS AND METHODS

In present study we used 250 femurs from different colleges in south India. The following measurements were conducted Neck shaft angle, Femoral Length and Neck Length of femur. Instruments Used for this study are Sliding Caliper, Osteometric Board. The number of nutrient foramina and their location in respect to the proximal end of femur on both sides were studied.

RESULTS

The results of present study are the Physiological length of left femur was 44.15±2.35 and right

Table 1: Showing that different parameters of right and left femur.

Sl. No	Indices	Right Femur (Cm)	Left femur (Cm)
1	Physiological length	43.98±2.15	44.15±2.35
2	Rubusticity index	14.34±1.21	15.26±1.17
3	Platymetric index	86.32±6.15	85.70±6.35
4	Foraminal index	35-62%.	37-65%

was 43.98±2.15, the Rubusticity index of left femur was 15.26±1.17 and right was 14.34±1.21, the Platymetric index of left femur was 85.70±6.35 and right was 86.32±6.15, the Foraminal index of left femur was between 37-65% and right was 35-62% (Table No 1).

DISCUSSION

In the present study, the mean values of different measurement are not shown much significant. Compared to right the left femur was shown little higher values but not significant. Femoral anthropometry from the two different sides revealed slight variations that are likely to be the results of compounding factors such as nature of work, mode of life, metabolic status, continuous modifications that may affect the characteristics of man and the effects of civilization on the composition of the human body in both positive and negative ways. Our study results have correlated with the study of P Bokariya et al[11] and not correlated with Strecker W et al study[12].

In our study no femur has shown more than three foramina, these results are correlated with the study of Asala SA et al[13] but not correlated with the work of Longia GS et al[14]. The means of the PL measurement of the femora indicated that Central Indian individuals have retained medium femora when compared with those from other data available[12].

Our study is relevant to fracture treatment. Results of our study can be useful in intramedullary reaming and nailing of long bone in case of correction of fractures particularly in the weight bearing femur. There are very less studies like our study this knowledge will helpful in anthropological and medico-legal practice for sex determination and as well as to radiologists, rheumatologists and orthopedic surgeons for diagnosis and planning of treatment.

Conflicts of Interests: None

REFERENCES

[1]. Md. Shahajahan Chowdhury, Humaira Naushaba, AHM Mahbubul Mawla Chowdhury, Laila Farzana Khan, Jubaida Gulsan Ara. Morphometric study of fully ossified head and neck diameter of the human left femur. J. Dhaka National Med. Coll. Hos. 2012; 18 (02): 9-13.

[2]. Mahadevan V. Editor. Ankle and foot. In: Standring S, Borley NR, Healy JC, Collins P, Johnson D, Crossman AR, et al, editors. Gray's anatomy the anatomical basis of clinical practice. 40th ed. Spain: Churchill Livingstone Elsevier 2008; p. 1429-62.

[3]. Beal TJ, Robinson PD. Infratemporal and Pterygopalatine fossae and Temporomandibular joint. In: Standrings Borley NR, Healy JC, Collins P, Johnson D, Crossman AR,et al. eds. Gray's Anatomy: The Anatomic basis of clinical practice. 40th ed. UK: Elsevier Churchill Livingstone 2008; pp.530-3.

[4]. Gupta et al. Forensic Anthropology, Physical Anthropology, Femur, Sex Determination, Human Identification. 2003; 25-27.

[5]. Jiang, L. S, Shen, L, Dai, L. Y. Intramedullary fixation of subtrochanteric fractures with long proximal femoral nail or long gamma nail: technical notes and preliminary results. Ann. Acad. Med. Singapore 2007;36(10):821-6.

[6]. Mahaisavariya B, Sitthiseripratip K, Tongdee T, Bohez E. L, Vander Sloten J, Oris P. Morphological study of the proximal femur: a new method of geometrical assessment using 3-dimensional reverse engineering. Med. Eng. Phys. 2002; 24(9):617-22.

[7]. Mishra A. K, Chalise P, Singh R. P., Shah R. K. The proximal femur - a second look at rational of implant design. Nepal Med. Coll. J.2009; 11(4):278-80.

[8]. Kaya, M, Nagoya S, Sasaki M, Kukita Y, Yamashita T. Primary total hip arthroplasty with Asian-type AML total hip prosthesis: follow-up for more than 10 years. J. Orthop. Sci. 2008;13(4):324-7.

[9]. Koval, K. J. Intramedullary nailing of proximal femur fractures. Am. J. Orthop. 2007; 36(4):4-7.

[10]. Wojciech Bolanowski, Alicja Smiszkiewicz Skwarska, Michal Polguj, The occurrence of the third trochanter and its correlation to certain anthropometric parameters of the human femur Folia Morphol. 2005; 64(3).

[11]. P Bokariya, R Kothari, JE Waghmare, AM Ttarnekar, IV Iingole . Anthropometric study of femur in central indian population. JMGIMS; 2009:14(ii): 47–49.

[12]. Strecker W, Keppler P, Gebhard F, Kinzl L.Length and torsion of the lower limb. Br J Bone Joint Surg. 1997;79:1019-23.

[13]. Asala SA, M bajiorgu FE, Papandro B A. A comparative study of femoral head diameters and sex differentiation in Nigerians. Acta Anatomica 1998;162:232-7.

[14]. Longia GS, Ajmani ML, Saxena SK, Thomas RJ. Study of diaphyseal nutrient foramina in human long bones. Acta Anat (Basel). 1980;107(4):399-406.

How to cite this article:
Shakil Mohamad Khan, Shaik Hussain Saheb. ANTHROPOMETRIC STUDY OF FEMUR IN SOUTH INDIA. Int J Anat Res 2014;2(4):630-632.
DOI: 10.16965/ijar.2014.511