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Comparison of Humerus and Femur with Respect to Location and Number of Nutrient Foramina

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Abstract

Background: Physical anthropology provides scientific method and technique for taking various measurements in different geographic regions and races.

Aims & Objectives: The study was aimed at determining measurements for obtainingforaminal index for both femur and humerus.

Material & Methods: In this study 80 (44 right and 36 left) intact human adult femora and 60 (36 right and 24 left) adult human humerie were obtained from teaching skeletal collections at Department of Anatomy, Mahatma Gandhi Institute of Medical Sciences, Sevagram. A hand lens, osteometric board and measuring tape were used for this purpose.

Results: Foraminal index was between 33 to 62% for left femur when calculated from proximal end and between 31 to 61% for right femur. The foraminal index was between 40 to 64% for left humerus when calculated from proximal end and between 45 to 64% for right humerus.

Conclusion: The findings observed in this investigation have immense utility for medico legal experts. The details of data obtained with relevant review of literature were discussed.

Keywords: Physical anthropology, Femur, Humerus, Nutrient Foramen, Foraminal index.

Introduction

The nutrient foramen of bone is site through which nutrient artery enters to supply nourishment to bone. The location and number of foramina remains is non constant feature in long bones. Morphology and statistical analysis of femoral and humeral anthropometry among different populations reveals a great degree of variation with respect to nutrient foramina [1, 2]. The femur and humerus are complex anatomic units in human. Thus an anthropometric study was devised to see the location and number of nutrient foramina in them.

Objectives

Many studies have shown the location and position of foramina in humerus and femur bones individually [1, 2]. However, there are very less study available where comparison of both is being shown as far as data of central Indian population is concerned. Thus present study was conducted to compare humerus and femur with respect to nutrient foramina.

Material and methods

In this study 80 (44 right and 36 left) intact human adult femora and 60 (36 right and 24 left) adult human humerie were obtained from teaching skeletal collections at Department of Anatomy, Mahatma Gandhi Institute of

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Medical Sciences (MGIMS), Sevagram. The number of nutrient foramina with their location and direction in respect to proximal end of femur and humerus on both sides were studied with aid of hand lens, osteometric board and measuring tape. Total length of humerus was also noted as projective distance between highest point of humerus head and deepest point of capitulum of humerus [3].

Results

The following observations were found to conclude the results of study.

Location of foramina

The foraminal index was noted with respect to proximal end. The observed foraminal index and total length of femur and humerus bones in both sides were summarized in Table I. Results indicated that difference between right and left femur was statistically insignificant. However, left femur has shown higher values as compared to right counterpart. Foraminal index was between 33 to 62% for left femur when calculated from proximal end and between 31 to 61% for right femur. The foraminal index was between 40 to 64% for left humerus from proximal end while for right humerus showed index between 45 to 64%. The statistical analysis of foraminal indices was also insignificant but comparatively lower location of humerus of both sides as seen in femur.

Direction of foramina

The direction of nutrient foramina was not show deviation from normal anatomical feature even in single case throughout experimental phase. The foramina was directed downward in humerus and upward in femur.

Number of foramina

The respective frequency of number of foramina was shown in Table II. The number of foramina was showed remarkable difference between two bones. Statistical analysis was also proven the significant difference between two long bones on both sides**.** Only humerus bone was shown 3 foramina. However, majority of bones were possessed single foramina**.** Likewise, number of nutrient foramina was increased in frequency of double, single and triple foramina for left femur and single, double and triple foramina per bone at right femur.

Table I: Showing Foraminal indices and total length for both humerus and femur and comparative account of two is also shown

	Femur		Humerus	
Side	**Left**	**Right**	**Left**	**Right**
Foraminal Index	33 to 62%	31 to 61%	40 to 64%	45 to 64%
Total Length (cms)	42.95 ± 1.67	42.69 ± 1.94	30.71 ± 1.27	31.29 ± 1.82
	p>0.05, Non Significant			

Table II: Showing number of nutrient foramina seen in femur and humerus of both sides

S. No.	Number of Foramina	Left Femur	Right Femur	Left Humerus	Right Humerus
1.	Single	41.67%	50%	79.17%	86.11%
2.	Double	52.79%	43.18%	16.67%	13.89%
3.	Triple	5.6%	6.81%	4.17%	0 %
p<0.05	Statistically Significant				

Discussion

In the present investigations, anthropometry of two different long bones were revealed slight variations which were likely to be result of compounding factors such as nature of work, mode of life, metabolic status, continuous modifications. It may affect the characteristics of man and effects of civilization on composition of human body in both positive and negative ways.

None of femora in present study was shown more than three foramina which correspond to earlier work [2, 4, 5]. However, few workers were also reported even 4 foramina [2]. Considering this fact, there is important significance in number of foramina on humerus and femur. It can be of immense utility in medicolegal cases where only part of bone is found. In many cases such as excavation, burning etc.; it is always an important challenge for experts to find identification of bones. The correct identification may further solve many mysteries pertaining to identification of diseased victim. The present study was an effort that could help us in determination of sex from bones in absence of any records.

Conclusion

Current findings may be having immense utility for medicolegal experts. These observations can be utilized in cases of exhumation and unidentified remains of bones. The femur and humerus have been studied successfully by physical anthropologists for many years. Incorporation of findings from this study could be uttermost utility for forensic anthropologist. This study was also relevant to fracture treatment and findings could be useful in intramedullary reaming, nailing of long bone, correction of fractures particularly in weight bearing femur and humerus.

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