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ORIGINAL RESEARCH

Assessment of nutrient foramina in dry femur bones

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ABSTRACT

Background: The Femur bone is a highly vascular structure with unique features in its blood supply. The present study was conducted to assess nutrient foramina in dry femur bones.

Materials & Methods: 80 dry femora obtained in Anatomy department were observed for number of nutrient foramen (NF) and location of nutrient foramen. The total length of each bone and distance of nutrient foramen from the proximal end of the bone was measured by using Osteometric board. The Femoral Index (FI) was calculated using HUGH'S Formula.

Results: Single nutrient foramina was seen in 38 on left side and 35 on right side. Double nutrient foramina were seen in 2 on left side and 5 in right side. The difference was significant (P< 0.05). Nutrient foramina on linea aspera was seen in 36 on left side and 37 on right side, on lateral surface 3 on left side and 2 on right side and on medial surface 1 on left side and 2 on right side. The difference was non- significant (P> 0.05). The mean femoral index on right side was 44.3 and on left side was 45.8.

Conclusion: Complete knowledge of location, size, and number in relation to the length and foramen index of the bone has crucial role in orthopaedic surgical procedures like bone resection and transplantation.

Key words: Femur, Periosteum, nutrient

INTRODUCTION

The Femur bone is a highly vascular structure with unique features in its blood supply.[1] Blood supply to the long bones in Human body is by nutrient arteries, eipiphyseal arteries, metaphyseal arteries and periosteal arteries. Nutrient arteries play a significant role in blood supply of long bone inner 2/3rd of cortex and whole medulla of the diaphysis.[2]

Blood supply of living bones comes from many small vessels in the periosteum and from a large nutrient artery that enters the body through nutrient foramina. During early stages of bone formation, the main source of blood supply to long bones is from nutrient artery. The nutrient artery enters the diaphysis of the long bones obliquely.[3] The point of entrance and angulations are relatively constant direction of the nutrient foramina is determined by the growing end of the bone. In long bones, typically, the diaphyseal nutrient vessels move away from the growing end.[4]

The nutrient artery to femur is a branch of profunda femoris artery of femoral artery.[5] The nutrient foramen of femur is single, located on the Linea aspera on posterior surface near the

proximal end of the bone and directed upwards. Sometimes more than one nutrient foramina and the nutrient foramen found on the lateral or medial surface of the shaft of the femur.[6] The present study was conducted to assess nutrient foramina in dry femur bones

MATERIALS & METHODS

The present study comprised of 80 dry femora obtained in Anatomy department. The study was approved from ethical committee of institute.

All the femur bones observed for number of nutrient foramen (NF) and location of nutrient foramen. The total length of each bone and distance of nutrient foramen from the proximal end of the bone was measured by using Osteometric board. The Femoral Index (FI) was calculated using HUGH'S Formula. Results of the study was compiled and assessed statistically. P value less than 0.05 was considered significant (P< 0.05).

RESULTS

Table I Incidence of nutrient foramina

Number	left	Right	P value
Single	38	35	0.91
Double	2	5	0.05
Total	40	40	

Table I shows that single nutrient foramina was seen in 38 on left side and 35 on right side. Double nutrient foramina were seen in 2 on left side and 5 in right side. The difference was significant (P< 0.05).

Table II Nutrient foramina on surfaces

LA	left	Right	P value
Linea aspera	36	37	0.92
Lateral surface	3	2	0.95
Medial surface	1	2	0.92
Total	40	40	

Table II, graph I shows that nutrient foramina on linea aspera was seen in 36 on left side and 37 on right side, on lateral surface 3 on left side and 2 on right side and on medial surface 1 on left side and 2 on right side. The difference was non- significant (P> 0.05).

Graph I Nutrient foramina on surfaces

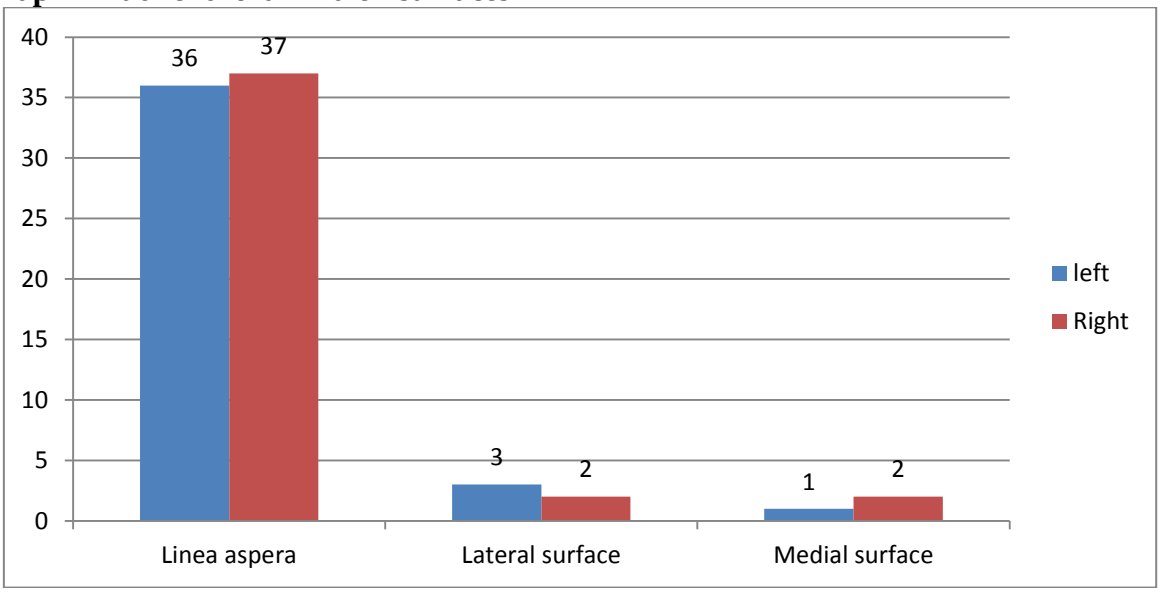

Table III Assessment of femoral index

Femoral index	Mean	P value
Right	44.3	0.87
Left	45.8	

Table III shows that mean femoral index on right side was 44.3 and on left side was 45.8.

DISCUSSION

The nutrient foramina of femur remained constant in position with increasing age.[7] The number, position, symmetry of the diaphyseal nutrient foramina. The nutrient foramina are restricted to the linea aspera or its immediate neighborhood in the middle third of the bone.[8,9] The location of the nutrient foramina was predominant on the posterior aspect of the lower limb long bones. The majority of the bones had a single nutrient foramen indicated the single source of blood supply to the femur.[10,11] The present study was conducted to assess nutrient foramina in dry femur bones.

We found that single nutrient foramina was seen in 38 on left side and 35 on right side. Double nutrient foramina were seen in 2 on left side and 5 in right side. Sailakumari et al[12] 114 Dry femora (Right: 58, Left: 56) were collected. There were 56 bones with single nutrient foramen on right femur bones, 2 bones noted with double nutrient foramen and also noted 55 bones with nutrient foramen on its linea aspera, 3 bones with nutrient foramen on its lateral surface out of 58 right femur bones in the present study. They noted 53 bones with single nutrient foramen on left femur bones, 3 bones noted with double nutrient foramen and also noted 52 bones with nutrient foramen on its linea aspera, 3 bones with nutrient foramen on its lateral surface, 1 bone with nutrient foramen on its medial surface out of 56 left femur bones.

We observed that nutrient foramina on linea aspera was seen in 36 on left side and 37 on right side, on lateral surface 3 on left side and 2 on right side and on medial surface 1 on left side and 2 on right side. Murali Krishna et al[13] determined the number, position, size, direction of the nutrient foramina and the Foramen Index of the human dry femur bones. Average length of the femur on the right side was observed to be 43.48 ± 2.70 cm and on left side 43.71 ± 2.94 cm. The foramen index on right side was 42.01 ± 10.37 cm where as on the left side 39.02 ± 8.56 cm. The nutrient foramen was directed towards the upper end of femur in all the bones studied. Most of the foramen were observed on the linea aspera in the middle third of the bone. This study may add to the present statistical data available on foramen index, number of foramen and their location in the population of Telangana region, during recent orthopaedic techniques like bone resection and transplantation.

We observed that mean femoral index on right side was 44.3 and on left side was 45.8. Oladayo Sunday Oyedun[14] observed that the mean Foramen Index of left femurs (44.40 ±9.34) was significantly higher than that on the right femurs (40.11±8.50). Our resuls are in agreement with these findings.

The limitation of the study is small sample size.

CONCLUSION

Authors found that complete knowledge of location, size, and number in relation to the length and foramen index of the bone has crucial role in orthopaedic surgical procedures like bone resection and transplantation.

REFERENCES

1. Hughes H. The factors determining the direction of the canal for the nutrient artery in the long bones of mammals and birds. Acta Anat (Basel) 1952;15:261- 280.

2. Raj Kumar, Raghuveer Singh Mandloi, Alok Kumar Singh, Devesh Kumar, Pawan Mahato; Analytical and morphometric study of nutrient foramina of femur in rohilkhand region; Innovative Journal of Medical and Health Science 2013;3:52-54.
3. Datta AK. Principles of general Anatomy. 6th ed. Kolkata, India: Current books international; 2010.p.75-77.
4. Laing, P. G. The blood supply of the femoral shaft. J. Bone Jt.Surg. 1953;35: 462-466.
5. Sendemir E., Cimen A. Nutrient foramina in the shafts of lower limb long bones: situation and number. Surg. Radiol. Anat. 1991;13:105-108.
6. Gumusburun E., Yucel F., Ozkan Y., Akgun Z. A study of the nutrient foramina of lower limb long bones. Surg. Radiol. Anat. 1994;16:409-412.
7. Lutken P. Investigation into the position of the nutrient foramina and the direction of the vessel canals in the shafts of the humerus and femur in man. Acta anat. 1950;9:57-68.
8. Patake SM, Mysorekar VR. Diaphysial nutrient foramina in human metacarpals and metatarsals. J Anat 1977;124:299-304.
9. KU Prashanth, BV Murlimanju, Latha V. Prabhu, Chettiar Ganesh Kumar, Mangala M. Pai, KVN Dhananjaya, Morphological and topographical anatomy of nutrient foramina in the lower limb long bones and its clinical importance; Australina medical journal, 2011;4(10):530-537.
10. Collipal, E., Vargas, R., Parra, X., Silva, H., Sol, M. Diaphyseal nutrient foramina in the femur, tibia and fibula bones. Int. J. Morphol. 2007;25(2):305- 308.
11. Henderson RG. The position of the nutrient foramen in the growing tibia and femur of the rat. J Anat 1978;125:593-599.
12. Sailakumari V, Reddy GM, Lokanadham S. Morphometric Study of the Nutrient Foramina of Human Femora and its Surgical Significance. Sch Int J Anat Physiol 2019;341-43.
13. Murali Krishna S, Udaya Kumar P, Sirisha V, Rajesh V. MORPHOLOGIC AND MORPHOMETRIC STUDY OF THE NUTRIENT FORAMINA IN DRY HUMAN FEMUR BONES OF TELANGANA REGION. Int J Anat Res 2016;4(2):2464-2468.
14. Oladayo Sunday Oyedun; Morphometric Study of Diaphyseal Nutrient Foramen in dried Nigerian femurs: Implications for Microvascular bone graft. Advances in Life Science and Technology; 2014;23:91-96.