

ANATOMICAL STUDY OF NUTRIENT FORAMINA IN ADULT HUMAN FEMUR BONES

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ABSTRACT

Introduction: The nutrient foramen is defined as the largest foramen present on the shaft of long bones allowing nutrient artery to enter the bone, the role of which is important in providing nutrition and growth of long bones.

Materials and Methods: The present study was conducted on 80 dry femur bones of unknown age and sex, which were obtained from Department of Anatomy, GMC Jammu. Adult femur bones were examined for number and position of nutrient foramen.

Result: Out of 42 right sided femur bones, 4 (9.52%) had two nutrient foramina and 38 (90.47) had one nutrient foramen. Out of 38 left sided femur bones evaluated, only 1 (2.63%) had two nutrient foramina and 37 (97.36%) had single nutrient foramen. In 42 right femur bones, 28 nutrient foramina were present in upper one-third portion, 17 nutrient foramina were present in middle one-third and 1 nutrient foramen was present in lower one-third portion of femur bone. In 38 left femur bones, 24 nutrient foramina were present in upper one-third portion, 14 nutrient foramina in middle one-third and 1 nutrient foramen in lower one-third portion of femur.

Conclusion: Knowledge of nutrient foramen number and position is of great importance for orthopedicians, radiologists, plastic surgeons and vascular surgeons for avoiding any damage to the nutrient vessels during surgical procedures.

KEY WORDS: Nutrient Foramen Position, Femur, Nutrient Foramen Number.

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INTRODUCTION

The nutrient artery is the principal source of blood supply to the long bone and is particularly important during its active growth period in the embryo and fetus, as well as during the early phase of ossification [1]. The nutrient foramen is defined as the largest foramen present on the shaft of long bones allowing nutrient artery to enter the bone, the role of which is important in providing nutrition and growth

of long bones. Knowledge of location and number of nutrient foramina in long bones is therefore important in orthopaedic surgical procedures such as joint replacement surgeries, fracture fixation, bone grafts and vascularised bone microsurgery [2]. Bones are structures that adapt to their mechanical environment and from a fetal age adapt to the presence of naturally occurring holes which allow blood vessels to pass through the bone cortex [3].

Gopalakrishna K and Rathna BS concluded that knowledge on incidence of the nutrient foramen will help the orthopaedic surgeon in avoiding vascular injury, to assess the prognosis of surgery and to get better result in bone graft and fracture healing and also has academic, clinical and medico legal importance [4]. Krishna SM et al, stated that thorough understanding of nutrient foramina has crucial role in orthopaedic surgical procedures like bone resection and transplantation [5].

MATERIALS AND METHODS

This study was conducted on 80 dry femur bones of unknown age and sex, which were obtained from Department of Anatomy, GMC Jammu. Out of 80 bones selected for the study 42 were right sided and 38 left sided which were properly labeled. The length of femur was measured by osteometric board. Nutrient foramina were identified by the presence of well marked groove leading to them, often slightly raised edge at the commencement of that canal (figure 1). The nutrient foramina were studied with regards to their number and position on the shaft. The position of the nutrient foramen on the femur bone was analyzed and encircled using a black marker pen.

Fig. 1: Nutrient Foramen on Femoral shaft.



RESULTS

The number of nutrient foramina was different in right and left sided femur bones. Out of 42

right bones, 4 (9.52%) had two nutrient foramina and 38 (90.47) had single nutrient foramen. Out of 38 left bones, only 1 (2.63%) had two nutrient foramina and 37 (97.36%) had single nutrient foramen. From total 80 bones studied, 5 (6.25%) had two nutrient foramina and 75 (93.75%) had single nutrient foramen (Table 1).

Table 1: Number of nutrient foramina on right and left sided femur bones.

Femur bones	Number of bones	Number of nutrient foramina			
		One	%	Two	%
Right	42	38	90.47	4	9.52
Left	38	37	97.36	1	2.63
Total	80	75	93.75	5	6.25

Out of forty two right femur bones studied, 28 nutrient foramina were present in upper one-third portion, 17 nutrient foramina were present in middle one-third portion and only 1 nutrient foramen was present in lower one-third portion of femoral shaft. In thirty eight left femur bones studied, 24 nutrient foramina were present in upper one-third portion, 14 nutrient foramina in middle one-third portion and only 1 nutrient foramen was present in lower one-third portion of shaft. In total among eighty femoral bones studied, 52 nutrient foramina were present in upper one-third portion, 31 nutrient foramina in middle one-third and 2 nutrient foramina in lower one-third portion of femoral shaft (Table 2).

Table 2: Position of nutrient foramina in right and left sided femur bones.

Femur bones	Number of bones	Position of nutrient foramina		
		Upper 1/3 rd of shaft	Middle 1/3 rd of shaft	Lower 1/3 rd of shaft
Right	42	28	17	1
Left	38	24	14	1
Total	80	52	31	2

DISCUSSION

The topographical knowledge of nutrient foramina is useful in certain operative procedures, in orthopaedic as well as in plastic and reconstructive surgery, to avoid damage to the nutrient vessels. Present study reveals number and position of nutrient foramen in femur bone. 90.47% (R) and 97.36 % (L) possessed single nutrient foramen. Krishna SM et al, also calculated number of nutrient foramina and their

results were not in concinnity with the present study [5]. Bhat D, conducted study on 300 femur bones and observed that 60% of the bones had double, 39.33% had single and 0.67% had three nutrient foramina [6]. Poornima B and Angadi AV, conducted their study on 100 femur bones, 62 had single nutrient foramen, 37 had two nutrient foramina and one had three nutrient foramina [7].

The present study reveals that most of nutrient foramina are present in upper one-third of the femoral shaft. Krishna SM et al, also worked on same parameter and found that among right femur bones 23 had nutrient foramina in upper one-third, 84 had foramina in middle one-third and 7 had in lower one third and from left femur bones 14 had nutrient foramen in upper one-third, 71 in middle one-third and 13 had nutrient foramen in lower one third of shaft [5], but their findings are not in accordance with results of our study observations.

CONCLUSION

our this study regarding nutrient foramen number and position will help orthopedicians, radiologists, plastic surgeons and vascular surgeons in avoiding any damage to the nutrient vessels during surgical procedures.

Conflicts of Interests: None

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