Original Article

DIAPHYSEAL NUTRIENT FORAMINA IN DIRED HUMAN ADULT LONG BONES OF UPPER LIMB IN PAKISTAN

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ABSTRACT

BACKGROUND: *Large and tiny foramina on long bones allow blood vessels to enter. These foramina, which go by diaphyseal nutrient foramina, are bigger and are found mostly in the long bone shafts, where they enter nutrition canals that lead to the medullary cavity. These nutrition canals house nutrient arteries and veins, which may be seen in long and irregular bones. These foramina are located in the shafts of long bones and various places in irregular bones. The orientation of the nutrition foramina, which develops quicker than the non-growing end, is determined by the growing end of the bones.*

STUDY DESIGN: *A cross-sectional Study*

DURATION AND PLACE OF STUDY: *Department Of Anatomy, Ayub Medical College, Abbottabad from jan 2017 to Jan 2018*

METHODS: *The current investigation contained ninety human upper limb long bones. These skeletons were dried and cleaned. Thirty ulnae, 30 radii, and 30 humerii were among them. The anatomy departments of Ayub and Khyber Medical Colleges provided these bones, respectively. It was unknown how old and what gender the bones were. Every bone was examined macroscopically to determine the nutrition foramina's quantity, orientation, and direction. Simple counting was done for the number. The foramina were numbered one millimeter from the boundaries. Every location of the foramina was seen under a microscope. The stiff wire was employed for obliquity and direction.*

RESULTS: *This cross-sectional investigation included 90 lengthy bones of the upper Limb. The long bones of the upper limbs comprise 80% of a single nourishment foramina. There were two nutritional foramina in 18% of the upper limbs' long bones. The orientation of nutritional foramina was distal in humeri cases. In the cases of radii and ulnae, the orientation was proximal.*

CONCLUSION: *The research has supplied further details on the morphology, topography, and foramina index of the nutrient foramina. Given the growing popularity of micro-vascular bone transfer, anatomical data about the long bones of the upper limbs is crucial for doctors.*

KEYWORDS: *Bone cortex, ulnae, radii, humerii, nutrient foramina.*

INTRODUCTION

Blood flow is essential for osteogenesis, bone development maintenance, bone vitality, fracture, and other injury healing. Three different kinds of arteries deliver blood to the long bones. Arteries enter diaphysis, periosteal vessels, nutritional arteries, and epiphyseal metaphyseal vessels. These arteries are anastomosing with each other [1,2]. Through tiny foramina, these blood arteries penetrate the metaphyses and epiphyses. We refer to these foramina as nutritional foramina. Since cancellous bone undergoes most of the remodeling activity in adult bone, its vascular pattern is crucial1. If the nutritional artery is injured, the diaphysis may still get blood flow from the medullary and periosteal circulations, which means that the long bones of the upper Limb will not be severely affected. Large and

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small foramina, also known as nutritional foramina, are found in the long bones of the upper limbs and serve as blood vessel entrances [3,4]. They enter nutrition channels in long bones that lead to the medullary cavity. Long and asymmetrical bones have these channels[5].

The direction of the nourishment foramina is shown by the developing end of the bone, which grows more swiftly than the non-growing end. From the place of development, the nourishment tubes go outward[6, 7].

MATERIALS AND METHODS

Ninety-long bones from the human upper Limb were studied in this research. These skeletons were dried and cleaned. Thirty ulnae, 30 radii, and 30 humerii were among them. The anatomy departments of Ayub and Khyber Medical Colleges provided these bones, respectively.

It was unknown how old and what gender the bones were. Every bone was examined macroscopically to determine the nutrition foramina's quantity, orientation, and direction. Simple counting was done for the number. The foramina were numbered one millimeter from the boundaries.

Table 1: Number of diaphyseal nutrient foramina seen in long bones of upper limb

Bone	No. of bone	No. of Foramina	Percentage
Humerus (n=30)	20	1	66.6%
	9	2	30.3%
	1	3	3.3%
Radius (n=30)	30	1	100%
Ulna (n=30)	26	1	86.6%
	4	2	13.3%

Table 2: Direction and position of diaphyseal nutrient foramina in long bones of upper limb

Bone	Position			Direction of Foramina
	Type-1	Type-2	Type-3	
Humerus	4(9.09%)	38(86.36%)	2(4.5%)	Distally
Radius	15(50.0%)	15(50.0%)		Proximally
Ulna	10(31.25%)	22(67.7%)		Proximally

Every location of the foramina was seen under a microscope. The stiff wire was employed for obliquity and direction.

RESULTS

The orientation of nutritional foramina was proximal in all the ulnae evaluated in our investigation. 13.3% of them possessed double nutrient foramina, whereas 86.6% of them had single nutrient foramina. One nutrient, foramina, was present in 67.0% of the humerus in this investigation.

Nutrient foramina were doubled in 30.3%. Nutrient foramina comprised 3.3%. Nutrient foramina were directed distally in the humerus. Every radius had a single nutritional foramen. The directions of nutrients were proximally oriented.

DISCUSSION

Every long bone in the upper Limb has a specific location for nutrition foramina. The ulnae and radii's growth ends are near their lower ends. Still, the humerii's growing ends are toward their top ends.8 Humerii often contain radial grooves and double nutrient foramina (42%). In this regard, they are comparable to the earlier research conducted by Caroll 1963 and Kizil Kanat et al. (2007). The proportion of double formina in our research was 30.3% [9,10]. According to our investigation, the triple foramina was 3.3% [11,12].

Every radius in our investigation showed a single nutrient foramen. According to earlier research, ninety percent of the radii had solitary nutrient foramina, in line with Nagel's (1993) and Ferriol Campos's (1987) research. No radii lacking nutritional foramina were found in our investigation [13,14], and 15. 13.3% of ulnae instances had double nutrient foramina, compared to 86.6% with single nutrient foramina. Similar to research by Kizil Kanat et al., earlier investigations revealed a single nutritional foramen in Tulane (2007) [16].

In our study, humeri had nutrient foramina directed away from the growing end, which mates with the previous studies. Similarly, in cases of radii, nutrient cases foramina were in the proximal direction, which aligns with previous studies [17].

CONCLUSION

Our research supported earlier findings on the quantity and location of the nutrient foramina. Long bones in the upper Limb The clinical importance of the nutritional foramina was also shown by our investigation. To prevent injury to nutrient veins during surgical operations, the number and location of nutrient foramina in bone shafts must be precise.

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