

## A study of variations in the nutrient foramen of fibula in western Rajasthan population.

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**Abstract:** The fibula is located lateral to the tibia in the leg. The location of nutrient foramen in a bone is important for orthopaedic surgery, forensic science, anthropology, and anatomy. This study was aimed to evaluate the variation in the number and direction of nutrient foramen in fibular diaphysis of right and left side.

**Materials and methods:** In present study, sample of 76 adult dry fibulas [R-38, L-38] of western Rajasthan population were used. Variations in the number, location and distribution of nutrient foramen was observed, analysed and compared with earlier studies. Variation in the number of nutrient foramen was accounted and position of nutrient foramen was being frequently noted.

**Results:** Totally 70 nutrient foramina were found, in which 25.71% of fibula nutrient foramen towards the growing end was (R-31.25%, L-21.05%) and 74.28% were away from the growing end(R-68.75%,L-78.94%).

**Conclusion:** Significant variability in the number and direction of nutrient foramina in fibular diaphysis was observed between right and left side groups.

**Keywords:** Fibula, Nutrient foramen, Vascularised fibular graft.

### INTRODUCTION: -

The fibula is located lateral to the tibia in the leg.

The location of nutrient foramen in a bone is important for orthopaedic surgery, forensic science, anthropology, and anatomy.

The role of nutrient foramen in nutrition and growth of the bones is evident from term 'nutrient foramen' itself.<sup>1</sup>

This study was aimed to evaluate the variation in the number and direction of nutrient foramen in fibular diaphysis of right and left side.<sup>3</sup>

The detailed anatomical knowledge of the peroneal artery in relation to the fibula is the key to raising osteofasciocutaneous free flaps incorporating segments of the bone. Free vascularized diaphysis grafts may also be taken on a peroneal arterial pedicle.<sup>5</sup>

The knowledge and position of the nutrient foramina of fibula is important to proceed with the free transplants of the vascularized bone graft.<sup>6</sup>

The morphometric analysis of the position of the nutrient foramen of the fibula will help in harvesting vascularized graft of the bone, to preserve the circulation within bone, also to reconstruct and close the bone defects.<sup>2</sup>

The Knowledge and position of the nutrient foramina of fibula is important to proceed with the free transplants of the vascularized bone graft. Commonly the nutrient foramen is located in the middle third of the posterior surface of the fibula.

The fibular grafts are particularly useful to restore large diaphyseal defects because of their shape and mechanical properties.<sup>7</sup>

The study is undertaken, as the knowledge of nutrient foramina of fibula is useful for anthropologists, anatomists' forensic experts, orthopaedic and Plastic surgeons for fibula graft and micro-vascular bone transfer.<sup>8</sup>

## **Material and method: -**

The present study conducted on 76 dry adult human fibulae in the Department of anatomy, in medical colleges of western Rajasthan in jodhpur.

The fibulae serially numbered from 1 to 76 using blue plastic number plates.

## **Material use:**

**Source of data** – 76 dry adult human fibulae from the department of anatomy, jodhpur, and other Institute of Medical science Rajasthan.

**Inclusion criteria:** 76 dry adult human fibulae irrespective of sex and race.

**Exclusion criteria:** Deformed fibula, fibula showing gross asymmetry or broken rejected as unsuitable for the study.

Number, distribution and direction of nutrient foramen in relation to specific surface, border and growing ends of fibulae analysed, keen observation done for direction of nutrient foramen by using magnifying hand lens and then a thin stiff wire passed through the foramen to confirm its direction.

Then it noticed that which parts of bone possessed the absence, single or multiple foramen.

Nutrient foramen in each fibula encircled using red marker pen.

## **Statistical Analysis: -**

The collected data then entered in the Excel sheet and analysed by using different formulations.

The descriptive statistics, chi-square test, student t-test applied for analysing the data as applicable.

## **Result**

The observations made on the 76 dry adult human fibulae have been listed and the number, location and distribution of the nutrient foramen has been completely tabulated in the master chart, and represented in the tables.

Out of 76 fibulae observed, in 6 (7.89%) fibulae nutrient foramen was absent, 58 (76.31%) fibulae showed single nutrient foramen ,10 (13.15%) fibulae had Double nutrient foramen, and 2 (2.63%) fibulae had Triple nutrient foramen.

**Table:1 Study of no. of nutrient foramen in 76 fibulae**

No. of foramen	No. of fibulae	%
<b>0</b>	<b>6</b>	<b>7.89</b>
<b>1</b>	<b>58</b>	<b>76.31</b>
<b>2</b>	<b>10</b>	<b>13.15</b>
<b>3</b>	<b>2</b>	<b>2.63</b>
<b>Total</b>	<b>76</b>	<b>100</b>

**RIGHT FIBULA**

**Showing one foramina  
foramina**



**Showing two foramina**



**Showing three**



**LEFT FIBULA**

Showing one foramina Showing two foramina



Most common nutrient foramen was single NF observed in 26 (68.42%) right and 32 (84.21%) left fibulae. And less common foramen, Triple NF was seen in two (5.26%) right fibulae.

**Table 2: Distribution of nutrient foramen in Right (38) and Left (38) fibulae.**

No. of foramen	Right		Left	
	No	%	No	%
0	6	15.78	0	0
1	26	68.42	32	84.21
2	4	10.52	6	15.78
3	2	5.26	0	0

**Variations in the Direction of NF: -**

Total number of NF was showing 70 fibulae in 32 right and 38 left.

Foramen was directed away from growing end 22(68.78%) right fibulae and abnormal direction of NF OR towards growing end 10(31.25%) right fibulae.

**Table :3 variation in nutrient foramen of 70 fibulae.**

Side of fibula	Total no	Towards growing end		Away from growing end	
		No	%	No	%
Right	32	10	31.25	22	68.75
Left	38	8	21.05	30	78.94
Total	70	18	25.71	52	74.28

## Discussion

In the present study, observations were made on the 76 adult dry human fibulae. Variations in the number, location and distribution of nutrient foramen was observed analysed and compared with earlier studies by various authors.

In the present, study absence of NF was observed in 7.89% fibulae. This may be due to congenitally absent nutrient vessel or due to nutrient artery. This such cases the bone is likely to be supplied by periosteal arteries.

In bones with two nutrient foramen, it suggests that one of them would be the main NF and the other accessory NF; one contained an artery and vein, other only an artery. When three NF were present a solitary artery entered through one foramen, other contained both an artery and vein and another contained a solitary vein.<sup>4</sup>

In the present study, the direction of 74.28 % of NF was away from growing end while 25.71% towards growing end.

## CONCLUSION

The fibula is located on the lateral side of tibia together with tibia.

The location of nutrient foramen has importance in relation to plan for the fibular graft, as the middle third of the shaft is taken for implant. The objective of the present study was to locate and describe the position, number, and direction of nutrient foramina of fibula.

The present study was conducted on 76 dry adult human fibulae in the Department of anatomy, S.N.Medical college, jodhpur.

Most common nutrient foramen was single nutrient foramen 76.31% fibulae; the absence of foramen was in 7.89% fibulae. Double nutrient foramen in 13.15%, and triple NF in 2.63% fibulae.

The direction of NF, away from growing end was in 74.28% nutrient foramen and towards the growing end was in 25.71% nutrient foramen.

The morphometric study of nutrient foramen with regard to the number, location and position is assumed to be of great importance for clinicians, radiologists, Orthopaedicians and vascular surgeons.<sup>9</sup>

The knowledge and position of the nutrient foramen of fibula is important to proceed with the free transplant of the vascularized bone graft. Commonly, the NF is located in the middle third of the posterior surface of the fibula.<sup>10</sup>

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