

MORPHOLOGICAL AND MORPHOMETRIC STUDY OF FIBULA

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ABSTRACT

Background: The Fibula bone that lies lateral to the Tibia is important for talocrural joint stabilization. The morphology and morphometry of Fibula are important in the design and preparation of Fibula flap transfer in mandibular reconstruction. The nutrient foramina location is important for fibular shaft vascularization. Hence, the present study aims to investigate the morphology and morphometry of Fibula bone. **Materials and Methods:** This study was done on 50 Fibulas with the help of a thread, measuring scale, and vernier caliper the maximum length of Fibula, length and breadth of superior and inferior articulating facets were measured for right and left Fibula. The Nutrient foramina Location on the Fibula of both sides was noted. Data collection was analyzed by Microsoft Excel Software 2007 version and reported as mean $\pm$ SD.

Result: The mean length of right Fibula was 34.52 $\pm$ 1.34 cm and left Fibula was 34.24 $\pm$ 1.42 cm. The mean length and breadth of superior and inferior articulating facets were found to be between 1.35 cm to 1.85 cm for the right and left Fibula. Nutrient foramina in 93% cases were directed away from growing end (proximal epiphysis), while nutrient foramina in 7% cases were directed towards the growing end. The Posterior surface of Fibula shows the majority of the nutrient foramina. **Conclusion:** The Fibula Morphology and Morphometry is of clinical importance because it will be helpful to surgeons during bone repair, bone grafting and microvascular bone surgery.

INTRODUCTION

The fibula is a slender long bone located lateral to the tibia. The fibula is recognised by its head placed proximally, twisted shaft and lateral malleolus placed distally.^[1-3] The upper end or head is expanded and presents an oval facet which articulates with lateral tibial condyle. Neck of fibula is a constriction connecting the head with the shaft.^[4-7] The shaft of fibula presents three borders and three surfaces. A little proximal to the midpoint of the posterior surface, a distally directed nutrient foramen on the fibular shaft receives a branch of the fibular artery. The lower end of fibula is expanded anteroposteriorly to form the lateral malleolus. The lower end of fibula presents a triangular facet which articulates with the lateral talar surface.^[8-12] The Aim is to investigate the morphology and morphometry of fibula bone. The Objectives for the present study is to measure the length of fibula and the number of nutrient foramen of fibula, length and breadth of superior articulating facet, length and breadth of inferior articulating facet.

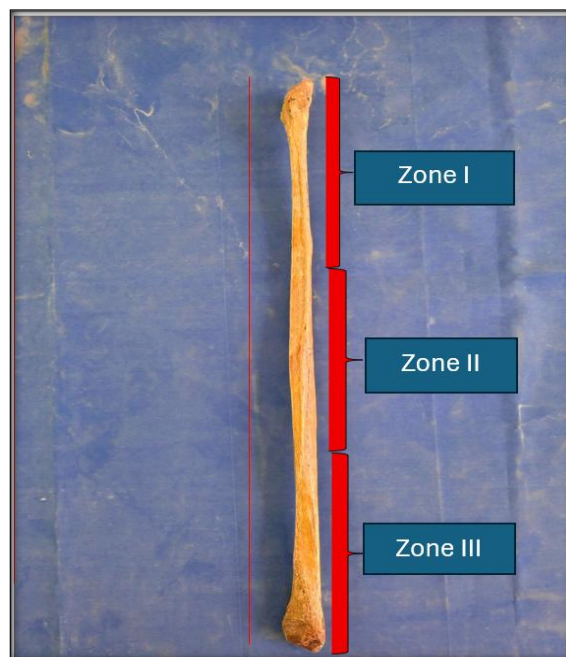


Figure 1: Different Zones in Fibula Bone and Measurement of Length of Fibula(Indicated by Red Line)



Figure 2: Measurement of Breadth of Distal Lateral Malleolus of Fibula



Figure 3: Measurement of Breadth of Proximal Head of Fibula

MATERIALS AND METHODS

The cross sectional study was done on 50 adult unpaired fibula bones of both limbs (25 right and 25

left) in the Anatomy Department , Gauhati Medical College and ethical clearance was taken from IEC. Normal fibula used in this study was taken from the Anatomy Department and from the medical students. Fracture fibula and tumours like abnormalities and deformities of fibula were not taken for the study. With the help of measuring scale, thread and vernier caliper, the measurements were taken for right and left fibula separately. The measurements were taken thrice, and an average of the three readings was calculated. All morphometric data were processed with MS Excel 2007 software and represented as mean $\pm$ SD.

RESULTS

The following observations were found in the present study. The mean and standard deviation (SD) of various parameters of both sides fibula is shown in [Table 1]. The maximum nutrient foramina were observed in zone II (middle 1/3rd) of both right and left fibula. The majority of nutrient foramina were present in posterior surface of both right and left fibula. Nutrient foramina in 93% cases were directed away from growing end (proximal epiphysis), while nutrient foramina in 7% cases were directed towards the growing end.

Table 1: Different parameters of right and left fibula in centimeter (cm)

S.N2	Parameters	Right side Mean $\pm$ SD	Left side Mean $\pm$ SD	p-value
1	length of fibula	34.52 $\pm$ 1.34	34.24 $\pm$ 1.42	0.24
2	Length of superior articulating oval facet	1.47 $\pm$ 0.20	1.44 $\pm$ 0.21	0.35
3	Breadth of superior articulating oval facet	1.54 $\pm$ 0.15	1.56 $\pm$ 0.12	0.15
4	Length of inferior articulating triangular facet	1.77 $\pm$ 0.26	1.74 $\pm$ 0.17	0.16
5	Breadth of inferior articulating triangular facet	1.38 $\pm$ 0.13	1.36 $\pm$ 0.15	0.28

P value <0.05 was considered as statistically significant

Table 2: Position and numbers of nutrient foramina of right and left fibula.

Position of Nutrient foramen	Number of Nutrient foramen in right fibula	Number of Nutrient foramen in left fibula	Total number of Nutrient foramen
Zone I (Upper 1/3 rd)	3	2	5
Zone II (Middle 1/3 rd)	20	17	37
Zone III (Lower 1/3 rd)	2	3	5
Total	25	22	47

DISCUSSION

Few fibula studies using different materials and techniques such as Plain radiographs, Computed Tomography (CT) scans have been carried out in different countries. The present morphological and morphometric study was done on fibula bones.^[13-16]

Table 3: Comparison of Morphological Patterns of Fibula between Present and Previous Studies

SL No.	Parameters of Fibula	Jayaprakash et al (50 fibulae), ^[10]	Gupta R et al (112 fibulae), ^[12]	Rajeev M et al (50 fibulae), ^[8]	Present Study (50 fibulae)
A)	length of Fibula				
1.	Right Fibula	35.8±2.72 cm	34.5±2.56 cm	33.4±1.74 cm	34.52±1.34 cm
2.	Left Fibula	35.68±2.2 cm	34.7±2.34 cm	33.6±1.8 cm	34.24±1.42 cm
B)	Location of Nutrient Foramen				
1.	Upper 1/3rd	10.63%	9.02%	12.5%	10.64%
2.	Middle 1/3rd	82.97%	81.95%	77%	78.72%
3.	Lower 1/3rd	6.38%	9.02%	10.41%	10.64%

CONCLUSION

In this study, it was observed that the nutrient foramen is most commonly located in the middle 1/3rd of Fibula. In harvesting the fibula, this segment is always taken, as the graft is more reliable regarding anastomosis and it must be used for transplant to reconstruct the mandible and stabilization of spine and tibia. Research Findings of this study may provide some additional data which will be helpful to clinicians for surgical procedures such as joint replacement therapy, repairing of fractures.

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