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Morphometric Analysis of Distal End of Dry Adult Human Fibulae

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ABSTRACT

Background: Ankle joint is one of the most frequently injured joint and very limited amount of studies is available on morphometry of the articular surfaces of bones forming the tibio-fibular mortise which will help in the reconstruction surgeries and in the manufacture of implants.

Methods: 120 dry adult fibulae (60 right & 60 left) obtained from the Department of Anatomy were studied.

Results: The mean height of talar facet on fibula was found to be 20.61±2.07 mm on the left side and 20.63±1.64 mm on the right side. The mean width of talar facet on fibula was found to be 18.07±2.14 mm on the left side and 18.03±1.98 mm on the right side.

Conclusions: The study provides a comprehensive data about the morphometry of distal end of dry adult fibulae which will help in reconstruction surgeries of the ankle joint.

Key Words: Fibula, Distal end, Talar facet

INTRODUCTION

Ankle joint is one of the most frequently injured joint and very limited amount of studies is available on morphometry of the articular surfaces of bones forming the tibio-fibular mortise which will help in the reconstruction surgeries and in the manufacture of implants¹. The distal tibia together with the fibula make a syndesmosis which forms the 'mortise' that articulates with the 'tenon', the talus at the talocrural joint.²

Ankle fractures have shown an exponential increase in incidence due to the high speed motorcycles on the roads. Better understanding of the mechanism of injury, and the displacements of the components: the lateral malleolus, the talus and the medial malleolus has resulted in better management of these injuries.³

Fibula plays a pivotal role in the tibio-fibular syndesmosis for the stabilization of the talocrural joint. Pre- and postoperative evaluation of talocrural fracture patterns are dependent on the distal fibular anatomy.⁴

MATERIALS AND METHODS

The study was conducted on dry adult human fibulae. The fibulae were obtained from the bone collection of the De-

partment of Anatomy of a tertiary care hospital. Of the total collection of fibulae in the department, 120 undamaged dry adult fibulae (60 right & 60 left), were selected for the study. The Fibulae were of undetermined gender & age. Each fibula was assigned a serial number. Anatomical measurements were taken using a vernier caliper (0-200 mm with a precision of 0.01 mm) and protractor. Damaged bones, bones affected due to any pathology were excluded. Statistical analysis: Descriptive statistical methods like mean, SD and percentage was used for depicting and analysing data.

Following parameters were recorded in a proforma:

1. Anteromedial distance of the facet for talus
2. Posteromedial distance of the facet for talus
3. Maximum height of the facet for talus
4. Maximum width of the facet for talus
5. Angle between sides of talar facet

RESULTS

The results obtained from the present study have been tabulated in table 1 and 2.

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Table 1: Facet for talus

Sr. No.	Parameter	Side	Mean (in mm)	Standard Deviation	'p' value
1	Anteromedial distance	Left	19.87	2.10	0.662
		Right	19.71	1.85	
2	Posteromedial distance	Left	20.44	2.05	0.132
		Right	19.91	1.81	
3	Height	Left	20.61	2.07	0.944
		Right	20.63	1.64	
4	Width	Left	18.07	2.14	0.920
		Right	18.03	1.98	

Table 2: Angle between sides of talar facet

Side	Mean (in degrees)	SD	'p' value
Left	65.88	6.58	0.089
Right	68.06	7.33	

DISCUSSION

The measurements of the distal end of tibia and fibula are vital in considering the stability of ankle joint, in designing of prostheses for use in ankle arthroplasty and in interpretation of diagnostic images of the ankle joint⁵

Table 3: Comparison of anteromedial distance of the facet for talus

Study	Year	Country	Mean (in mm)
Naidoo N ⁴	2015	South Africa	Male : 19.18±2.27 Female : 18.39±2.22
Present study	2018	India	Left : 19.87 ± 2.10 Right : 19.71± 1.85

Table 4: Comparison of posteromedial distance of the facet for talus

Study	Year	Country	Mean (in mm)
Naidoo N ⁴	2015	South Africa	Male : 19.18±2.27 Female : 18.39±2.22
Present study	2018	India	Left : 20.44 ± 2.05 Right : 19.91± 1.81

Table 5a: Comparison of maximum height of the facet for talus

Study	Year	Country	Mean (in mm)
Shirishkumar ⁴	2014	India	Left : 19.94 ± 1.81 Right : 20.07 ± 1.9
M.S. Patil ⁶	2012	India	Radiological - 27.2 Bone - 23.7
Raza HKT ³	2015	India	Left : 23.7 ± 2.2 Right : 23.7 ± 2.2
Present study	2018	India	Left : 20.6 ± 2.10 Right : 20.6 ± 1.60

Table 5b: Comparison of maximum height of the facet for talus

Study	Year	Country	Mean (in cm)
Gupta C ⁵	2017	India	Left : 2.04 ± 0.25 Right : 2.03 ± 0.16
Present study	2018	India	Left : 2.06±0.21 Right : 2.06± 0.16

Table 6a: Comparison of maximum width of the facet for talus

Study	Year	Country	Mean (in mm)
Naidoo N ⁴	2015	South Africa	Male : 18.77±2.27 Female : 17.14±1.50
Present study	2018	India	Left : 18.07± 2.14 Right : 18.03± 1.98

Table 6b: Comparison of maximum width of the facet for talus

Study	Year	Country	Mean (in cm)
Gupta C ⁵	2017	India	Left : 1.64 ± 0.20 Right : 1.66 ± 0.21
Present study	2018	India	Left : 1.81± 0.21 Right : 1.80± 0.20

Table 7: Comparison of angle between sides of talar facet

Study	Year	Country	Mean (in degrees)
Naidoo N ⁴	2015	South Africa	Male : 56.6 Female : 55.7
Present study	2018	India	Left : 65.88± 6.58 Right : 68.06± 7.33

CONCLUSION

The study provides a comprehensive data about the morphometry of distal end of dry adult fibulae which will help in reconstruction surgeries of the ankle joint. In addition, the osteometry of the talar facet will lead to advances in design of prosthesis regarding the talocrural joint.

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Figure 1: Illustration showing measurement of anteromedial distance of the facet for talus.



Figure 2: Illustration showing measurement of posteromedial distance of the facet for talus.



Figure 3: Illustration showing measurement of maximum height of the facet for talus.



Figure 5: Illustration showing measurement of angle between sides of talar facet.



Figure 4: Illustration showing measurement of maximum width of the facet for talus.