

Morphological and morphometrical analysis of talus bone with reference to sinus tarsi in dry human talar bone and its clinical applications

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ABSTRACT

Introduction: Talus morphology falls along morpholine that tracks locomotor function related to a more inverted or everted foot set. Aspects of the external bony morphology of the talus and distal tibia reflect kinematic differences between how terrestrial bipedal humans and arboreal, quadrupedal African apes load their foot and ankle during locomotion. The aim of the study is to analyze the variation of talus bone with respect to its morphological and morphometrical parameters and to correlate it with its clinical implications. **Materials and Methods:** In the present study, a total of 20 dry human talus bones of unknown sex and without any gross abnormality will be collected from the Department of Anatomy, Saveetha Dental College, Chennai, for evaluation. With the help of Vernier caliper and ruler, the measurements such as maximum talar length maximum talar breadth and maximum talar width will be measured. The results obtained were analyzed, tabulated, and represented graphically. **Results:** The variation in the morphological and morphometrical analysis of talus bone may have a clinical correlation. The values observed are tabulated and analyzed. The final observation was represented as mean \pm Standard deviation. **Conclusion:** Morphological and morphometrical analysis of talus bone with reference to sinus tarsi bone-in dry human talar bone was described to provide their morphology and clinical applications. The present study thus analyzed the morphology of the articular surfaces of the talus bone.

KEY WORDS: Morphology, Morphometry, Orthopedic surgery, Prostheses, Sinus tarsi, Sulcus tali, Talus bone

INTRODUCTION

The second-largest bone of the foot is talus. It is the chief link between the foot and leg. Talus is important bones for sex diagnosis and could effectively use as an alternative in forensic cases.^[1] The anteroposterior length of the left talus was more than right talus, while the transversal breadth of the right and left talus is sort of equal. The length of right sulcus tali appears to be more than left sulcus tali, whereas the width and depth of the right and left sulcus tali were almost equal.^[2] The left and right talus bones of intact human ankle joints show a strong degree of symmetry. Location of spatiality within the geometric form between the left and right talus bone at intervals equivalent subjects might facilitate orthopedic surgeons to set

up preoperatively for complicated talar fractures, and thus design accurate and functional talus bone prostheses.^[3]

The second-largest bone of the foot is talus. It is the chief link between the foot and leg. It is special features being no muscular attachments with less blood supply. Location of spatial property within the geometric form between the left and right talus bone among constant subjects might facilitate orthopedic surgeons to set up preoperatively for complicated talar fractures, and thus design accurate and functional talus bone prostheses.^[4] Talus bone is present between the distal tibia and the other bones of the foot. The thick layers of connective tissue and several articulations present a challenge to diagnostic imaging modalities and greatly limits surgical access for the treatment of talar fracture.^[5]

The talus is the axis of the ankle movements and a good indicator of the way of locomotion.^[6] The variations

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in the subtalar joint regarding its morphology and articulation of bones are common worldwide.^[7] The talus is the connection between the lower limb bones and the foot. Proximally, the talus articulates with the tibia.^[8] Talus and calcaneus bones share the bulk of load transmitted from the leg to the skeleton of the foot. The angular dimensions of the talus will be proportional to the morphology of the sustentaculum tali.^[9] There are three facets over the upper side of talocalcaneal joint: anterior talar facet, middle, and posterior.^[10] The talus, separate two synovial joints (i.e., joints separated by synovial capsules): the upper ankle joint (between trochlea, lateral, and medial articular facets of the talus and the tibia and fibula) and the talocalcaneonavicular joint.^[11]

Talus morphology falls along morpholine that tracks locomotor function related to a more inverted or everted foot set.^[12] Aspects of the external bony morphology of the talus and distal tibia reflect kinematic differences between how terrestrial bipedal humans and arboreal, quadrupedal African apes load their foot and ankle during locomotion.^[13] The most necessary factors influencing whole talar form were log center of mass size and substrate preference. Substrate preference was conjointly the foremost necessary issue process proximal body part morphology and unrelated to an alternative issue like mass, while distal articular morphology was influenced by superfamily (head angle and shape).^[14] The talus is easy for locating out relationships between morphology and performance throughout this context, as a result of it might be a serious contributor to the adduction-abduction, plantar-dorsal flexion, and inversion-eversion of the foot, and transmits all forces encountered from the foot to the leg.^[15]

MATERIALS AND METHODS

In the present study, a total of 20 dry human talus bones of unknown sex and without any gross abnormality will be collected from the Department of Anatomy, Saveetha Dental College, Chennai, for evaluation. The anterior and posterior articulating surfaces of talus are shown in Figure 1. The head of talus is shown in Figure 2. With the help of Vernier caliper and ruler, the measurements such as maximum talar length maximum talar breadth and maximum talar width will be measured. The results obtained were analyzed, tabulated, and represented graphically.

RESULTS

The mean diameter of the left posterior articulating surface is 2.85. The mean diameter of the right posterior articulating surface is 2.997. The diameter of both the left and right posterior articulating surface is almost the same. The mean diagonal of the left



Figure 1: Anterior and posterior articulating surfaces of talus

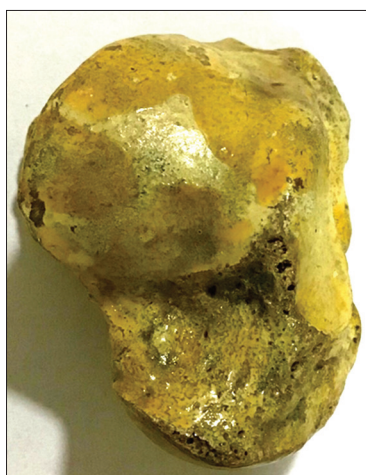


Figure 2: Head of the talus bone

posterior articulating surface is 3.295. The mean diagonal of the right posterior articulating surface is 3.215. The mean diagonal of this posterior articulating surface is differ in 0.08. The mean diameter of the left anterior articulating surface is 2.07. The mean diameter of the right anterior articulating surface is 2.07. The mean diameter of the anterior articulating surface is the same for both left and right and talus bones.

The mean diagonal of the left anterior articulating surface is 2.38. The mean diagonal of the right anterior articulating surface is 2.38. The mean diagonal of the anterior articulating surface is same for both left and right talus bones. The mean diameter of the left head of talus bone 2.575. The mean diameter of the right head of talus bone is 2.527. The mean diameter of the head of both right and left talus bone is differed 0.002.

The mean diagonal of the left head of talus bone 2.82. The mean diagonal of the right head of talus bone is 2.815. The mean diagonal of the head of both right and left talus bone is almost the same only differed

for 0.0015. This difference in measurement used for prosthesis of the new bone after the severe multiple crack fracture in talus bone. The measurement of three articulating surfaces was plotted graphically in the result [Figures 3-8].

DISCUSSION

Talus has two parts. Upper comma-shaped half is articular on top of, and therefore the lower part is non-articular. The articular surface articulates with

the medial malleolus. The posterior surface is little. It is marked by an oblique groove. The groove is finite by medial and lateral tubercles. Tendon of the flexor muscle hallucis longus passes through the groove. A posterior tubercle is also present.^[16,17] Sometimes its separate and in such cases, it is called os trigonum. Head of the talus is directed forward and slightly downwardly and medially. Its anterior articular surface is oval and convex.^[18] The long axis of this surface is directed downwardly and medially. The inferior surface is marked by three articular areas separated by indistinct ridges. The middle side is largest, oval and

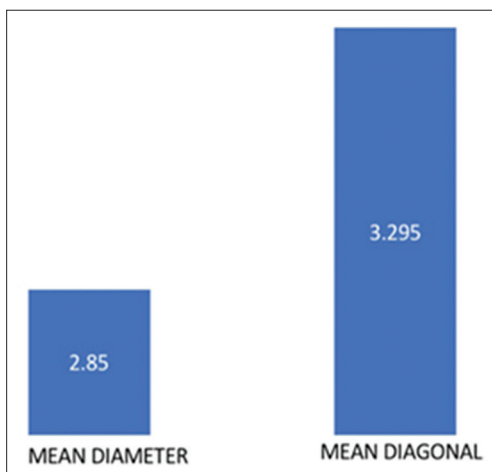


Figure 3: Measurement of the left posterior auricle

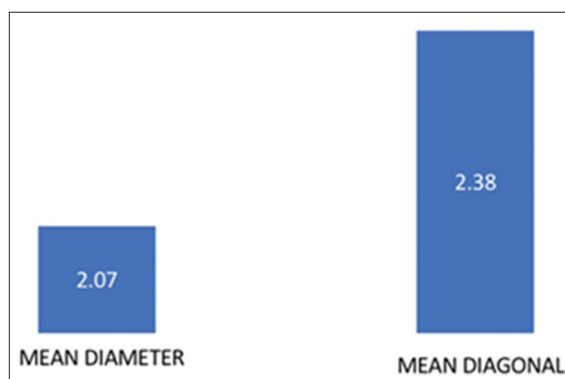


Figure 6: Measurement of the right anterior auricle

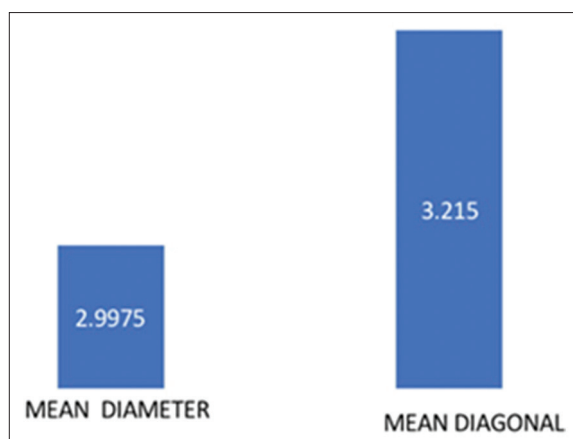


Figure 4: Measurement of the right posterior auricle

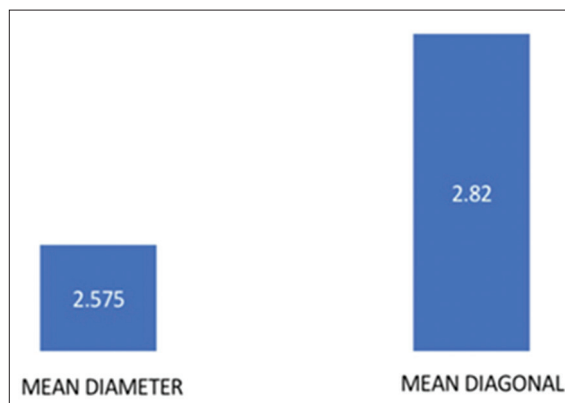


Figure 7: Measurement of the head of talus (left)

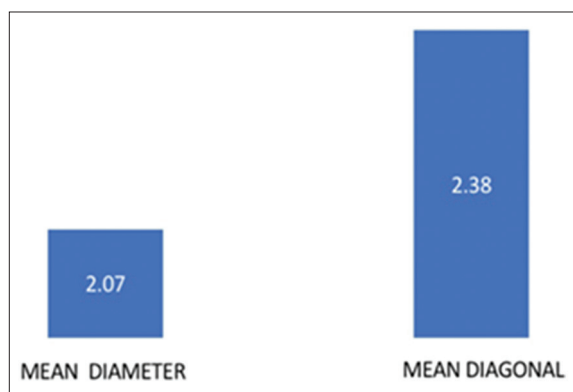


Figure 5: Measurement of the left anterior auricle

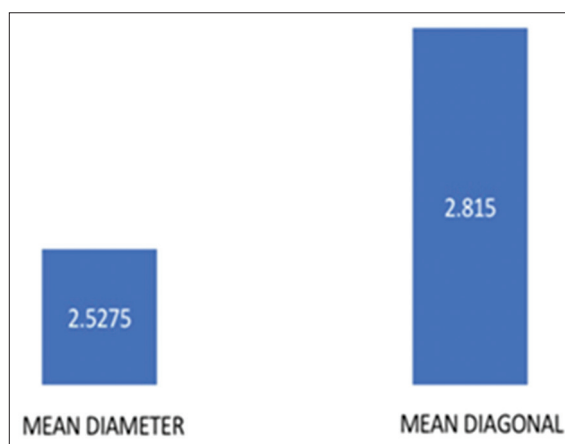


Figure 8: Measurement of the head of talus (right)

gently convex; it articulates with the middle facet of the calcaneum.

The anterolateral facet articulates with the anterior facet of the calcaneum and also the medial side with the spring ligament. The head of the talus nests among associate degree articulation called the socket pedis, or foot socket formed by the calcaneal middle and anterior surfaces connected to the large navicular articular surface by the inferior and superomedial calcaneonavicular ligaments.^[19] Talus is a common bone to get fractured. Neck a part of this bone is kind of at risk of fracture and should cause gangrene of talus because of disruption of blood supply. In habitual squatters, a squatting facet is commonly found on the upper and lateral part of the neck. The side articulates with the anterior margin of the lower finish of the shin throughout extreme flexion of the shin throughout extreme flexion of the ankle joint.^[20] The acetabulum pedis has a variable volume capability and adapts to the ever-changing position of the talar head throughout gait

CONCLUSION

Morphological and morphometrical analysis of talus bone with reference to sinus tarsi bone-in dry human talar bone was described to provide their morphology and clinical applications. The present study thus analyzed the morphology of the articular surfaces of the talus bone.

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