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RESEARCH ARTICLE

BILATERAL SYMMETRY OF THE TALUS: A STUDY ON 40 DRY ADULT TALI IN BIHAR

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ABSTRACT

Talus is considered as one of the durable bones of the foot. Researchers in the field of Anatomy, Anthropology and Forensic Medicine have performed numerous studies on talus. This study is designed to evaluate Talar length (Tl) Talar width (Tw) and Talar height (Th) from forty intact dry adult tali. This study aims to throw some light on morphometry of Talus bone in the state of Bihar and contribute to anatomic and forensic literature.

INTRODUCTION

The human foot is a highly developed biomechanically complex structure that serves to bear the weight of the body. About 26 bones in the foot play an integral role in providing structural support. They can be grouped conveniently as follows, Tarsals (7); Metatarsals (5) and Phalanges (14). Apart from these bones, there exist certain sesamoid bones which help to improve the functions of the foot. For descriptive purposes, the foot can be divided into a hindfoot containing the talus and calcaneus, a midfoot containing the cuboid, navicular and cuneiforms and a forefoot containing the metatarsals and phalanges. The word talus is derived from the Latin word *taxillus*, which refers to ankle bone of a horse. These bones were used as playing dice by Roman soldiers [1]. The talus is the second largest tarsal bone and has a unique structure designed to channel and distribute body weight [2]. Approximately 60% of its surface is covered by articular cartilage and there are no muscular or tendinous attachments to this bone [3]. Consequently, only a limited area of penetrable bone is available for vascular perforation. The talus has been extensively studied. Ossification of the talus originates from a single primary center that induces elongation in an anteroposterior direction [4].The talus as an entity articulates with navicular, calcaneum, tibia and fibula. The body of the talus is uniquely shaped being wider anteriorly and narrower posteriorly. The talar neck has a roughened appearance and paucity of cartilage due to multiple ligamentous insertions. The head is a convex structure with numerous articulations. Talus has also been studied by many researchers specially the presence of squatting facets [5]. Variations in talar anatomy can be of help for reconstruction and rehabilitation of foot [6]. Measures of cranium, pelvis and long bones are used to evaluate population, gender and age. However, it may also be required to use other bones in the researches using bone pieces instead of the entire bone [7]. The body and the neck of the talus are not coaxial. In the horizontal plane, the neck shifts medially and makes an angle of declination (AD) with the long axis of the trochlear tali; this angle is variable [8]. In the sagittal plane the neck is deviated downward relative to the talar body and makes an angle of inclination (AI) [9]. The talus is a good example of plasticity exhibited by bones in response to mechanical requirements of new functions, which are imposed on it, as the talus encounters several differential forces during locomotion [10]. The stress patterns across the talus influence its overall dimensions and articular surface areas.

MATERIAL AND METHOD

The study included 20 pairs of intact dry adult tali, which were obtained from the department of Anatomy of each of the following medical colleges in Bihar; Katihar Medical College and Patna Medical College. Age, sex, and race were not taken into consideration and bones with signs of previous fractures

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and other malformations were excluded from the study. Talar length (Tl) Talar width (Tw) and Talar height (Th) were measured using sliding Vernier calipers with an accuracy of 1mm. Bilateral differences if any were evaluated statistically.
Image 1 = Measurement of Tl
Image 2 = Measurement of Tw
Image 3 = Measurement of Th

Observation

Observations and comparisons are represented in Tables 1&2.

Table1 Measurement values of Talus bone

Parameter	Side	N	Mean	SD*	SEM#
Tl	R	20	5.31cm	0.37	0.08
Tl	L	20	5.31cm	0.34	0.08
Tw	R	20	4.02cm	0.24	0.05
Tw	L	20	4.02cm	0.26	0.06
Th	R	20	2.93cm	0.22	0.05
Th	L	20	2.93cm	0.24	0.05

SD* = Standard Deviation
SEM# = Standard Error of Mean

Table2 Comparison of parameters with other related studies

Authors	Mean Tl (R)	Mean Tl (L)	Mean Tw (R)	Mean Tw (L)
Ari *et al*	5.72 cm	5.64 cm	4.91 cm	4.69 cm
Mahato *et al*	5.57 cm	5.58 cm	2.90 cm	3.03 cm
Gautham *et al*	5.23 cm	5.29 cm	3.79 cm	3.68 cm
Motagi *et al*	5.42 cm	5.33 cm	3.62 cm	3.77 cm

DISCUSSION

Talus is a bone, which is used to determine unknown skeletal remains during archaeological and forensic science excavations due to its durability [11]. Talus is the key bone of the human body as it transmits the entire body weight. Since the talus endures many differential forces during locomotion, the stress patterns across the talus influence its overall dimensions [12]. Variations in Talar length (Tl), Talar width (Tw) and Talar height (Th) among different populations can reveal certain habitual activities that an individual in that population is engaged in. The above-mentioned findings can be useful in determining the race of unidentified bones. In the present study, we observed that there were no significant side related differences in the tali. We conclude that both tali in an intact skeleton are relatively similar and strongly symmetrical. Further, this study may be helpful for orthopaedic surgeons during surgical interventions on traumatic talus and for prosthetists during designing of talar prosthesis.

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