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Morphological Classification of Tali on the Basis of Calcanean Articular Facets-A Cadaveric Study in North Indian Population

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Abstract: ***Introduction: Out of different tarsal bones ,Talus (astragalus), is the only bone which has no muscular or tendinous attachment. It forms many joints like talocrural, subtalar and talocalcaneo-navicular joints. The prior acquaintance with the anatomical set up of talus and its various articulations holds significance not only in delineating the underlying pathology but also helps in its treatment. Material and methods: Comprised of 100 dry (50 Rignt &50Left) adult tali of unknown age and sex obtained from Department of Anatomy, Government Medical College,Amritsar. Each talus was examined for the presence of various patterns of articular facets. Results and Conclusion: Five types of tali were observed depending upon calcaneal articular facet: Type I (45%) tali had single calcanean facet. Type II (24%) tali had single calcanean facet divided by a ridge into two parts. Type III (9%) tali had two calcanean facets separated partly by a ridge and partly by a groove. Type IV (5%) tali had two calcanean facets separated by a non-articular groove. Type V (17%) has 2 subtypes :- (a) TypeV (A) (8%) tali had single calcanean facet, continuous with the posterior calcanean facet. (b) Type V (B) (9%) tali had two calcanean facets, continuous with the posterior calcanean facet. The calcanean articular facets of tali showed a wide variety of variations which may be due to material or population differences, type of gait and built of an individual or the place of living whether it is plane or hilly area. Familiarity with it will help in accounting the joint instability and arthritic changes in the vicinity of talus.***

Keywords: talus, articular facets, calcaneus

1. Introduction

Talus is the second largest of the tarsal bones and has a unique structure designed to channel and distribute body weight[1]. It takes part in the formation of talocrural, subtalar and talocalcaneo-navicular joints[2].The adequate knowledge of the anatomy of talus is significant not only to the anatomists but also to the orthopedic surgeons as fractures of the talus are quiet common and lead to avascular necrosis, arthritis and when unrecognized, to chronic pain and non-union[3] . Talectomy has been described as a limb-saving procedure for the treatment of neglected talipes equinovarus deformity[4] . Aviation accidents were the commonest cause of serious fractures and fracture dislocations of the talus during the period of 'World War I'.

Hence, talus was named as the "Aviator's astragalus"[5]. The frequency of fractures of the lateral process of the talus has markedly increased because of the expansion of snowboard activity. Hence, it is also known as 'snowboarder fracture[6] . Sometimes, the posterior process of the talus may ossify independently and persist in the adults as the os trigonum. Therefore, knowledge of the more commonly occurring accessory tarsal bones or ossicles has clinical significance in the correct interpretation of an X-ray of the foot, since they are liable to be mistaken for fractures[7]. Pes planus or flatfoot is a deformity in which there is loss of the medial longitudinal arch of the foot. It may be congenital or an inherited condition associated with mild subluxation of the subtalar joint[8]. Harris and Beath asserted that the fusion between the talus and the calcaneus was specifically responsible for the peroneal spastic flatfoot [9]. Donoghue and Sell quoted that talo-navicular synostosis in reality was a congenital absence of the navicular bone, accompanied by compensatory hypertrophy of the talus[10]. Arora et al. conducted a detailed study on 500 Indian human tali and examined that there are considerable variations in articular facets on the plantar surface of the head and body of talus [11]. A similar study was conducted by Bilodi[12] .These authors divided talar articular facets into different types and stated that these differences could be due to differences in gait, built and habitat of a person. Therefore, the prior acquaintance with the anatomical set up of talus and its various articulations holds significance not only in delineating the underlying pathology but also helps in its treatment. Thus, the present study was undertaken to note the general morphology, articular facets and variations of talus in both feet and to correlate the findings with the existing literature.

2. Material and Methods

Material for the study comprised of 100 dry (50 right&50 left) adult tali of unknown age and sex. The special emphasis was laid on the study of the articular facets. Each taluswas examined for the presence of various patterns of articular facets. Later they were classified into five groups. The shape and surface area of different articular facets of the talus was recorded. The margins of the articular facets were marked with brown, fine tipped sketch pen. The surface area was measured by tracing the margins of the articular facets directly on the tracing paper and then super-imposing it on the graph paper

with a least count of 1 mm. (one small square of the graph paper). The surface area was then calculated by counting the small squares on graph paper by using a hand lens. The tracing of less than half of one small square was discarded and more than half of the small square was counted as one[13].

3. Results

In the present study, various patterns in calcanean articular facets of 100 north Indian tali were observed and classified accordingly into five types (Figure 1). Type I (45%) tali had single calcanean facet. Type II (24%) tali had single calcanean facet divided by a ridge into two parts. Type III (9%) tali had two calcanean facets separated partly by a ridge and partly by a groove. Type IV(5%) tali had two calcanean facets separated by a non-articular groove. Type V (17%) has 2 subtypes :- (a) Type V (A) (8%) tali had single calcanean facet, continuous with the posterior calcanean facet. (b) TypeV(B) (9%) tali had two calcanean facets, continuous with the posterior calcanean facet. In the present study, Type I – tali were highest in incidences i.e. 45%and Type IV were lowest (5%). The results of the present study were compared with the previous studies as shown in the table 1.

Table 1: Incidences and types of calcanean articular facets

TYPES OF CALCANEAN ARTICULAR FACETS	Total		Right		Left	
	n (100)	%	n (50)	%	n (50)	%
Type I	45	45	26	52	19	38
Type II	24	24	7	14	17	34
Type III	9	9	4	8	5	10
Type IV	5	5	2	4	3	6
Type V	17	17	11	22	6	12
Subtypes						
(a) V(A)	8	8	6	12	2	4
(b) V(B)	9	9	5	10	4	8

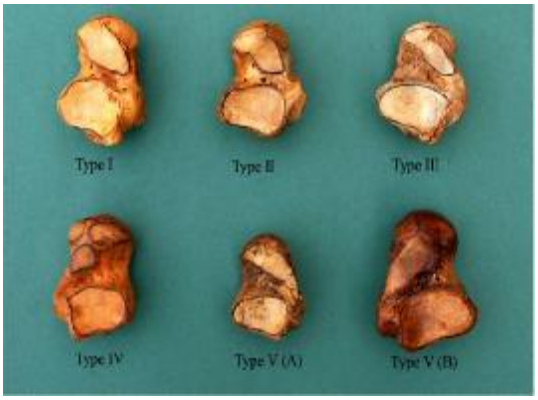

Figure 1: Morphological classification of tali on the basis of calcanean articular facets

4. Discussion

In the present series, type I talus was commonest (45%) but this observation was not in consonance with the previous works where this type of talus was observed to have a much lower incidence i.e. (16%) byArora et al .[11], 10% by Bilodi & Agrawal [14] and 10% by Bilodi [12] in similar studies on Indian population while, this type of talus was not described by Jones [15].The incidence of type II tali was 24% in the present series and this figure is comparable with the work of Bilodi &Agrawal [14] who gave this incidence of type II tali to be 14% [14]. Though, much higher figures of incidence of this type of talus have been reported byArora et al.[11] (78%) and Bilodi[12] (50%). The type III talus was observed to be 9% in the present series, a figure much lower compared to the figures reported by Bilodi &Agrawal [14] (20%)and Bilodi[12] (16.66%) respectively.Arora et al. have given this incidence to be 1%.[11] In the present series, the least common type of talus was found to be type IV (5%) which is in agreement with the work of Bilodi [12] (5%). Bilodi & Agrawal [14] did not observe this type of tali in their combined study. The figures were much lower in the study of Breathnach [16] andArora et al [11] i.e. 3%. The incidence of type Vtalus (17%) in the present study is comparable to the study of Bilodi [12] who found it in 18.44% cases and it was much higher as compared to Arora et al.[11] (2%) and was lower compared to Bilodi & Agrawal [14] i.e. 56%. In the study of Jones[15] and Breathnach [16], this type of talus was not reported. Further, in the present series, in type V, two subtypes were found and classified accordingly into typeV(A) based on the classification ofArora et al. [11] and type V (B) to that of Bilodi.[12] Type V (A) was present in 8% of cases and Arora et al.[11] found it in 2% cases.The type V (B) was found to be present in 9% cases while Bilodi [12] study reported it to be in 18.44% cases. The results of the present study showed a wide range of variations in the incidences of various types of tali compared to previous works. These variations may be due to material or population differences, type of gait and built of an individual or the place of living whether it is plane or hilly area.

Table 2

Comparison of classification of tali based on types of calcanean articular facets

Race	Workers	Years	(n)	(%)OF TYPES OF TALI						
				I	II	III	IV	V	V(A)	V(B)
———	Jones[24]	1946	——	——	*	*	*	——	——	——
———	Breathnach[40]	1965	——	*	*	*	3%	——	——	——
Indians	Arora et al[42]	1979	500	16%	78%	1%	3%	2%	——	——
Indians	Bilodi & Agrawal[41]	2003	50	10%	14%	20%	——	56%	——	——
Indians	Bilodi[43]	2006	240	10%	50%	16.66%	5%	18.44%	——	——
North Indians	Presentstudy	2007	100	45%	24%	9%	5%	17%	8%	9%

(* = % not given)

5. Conclusion

To conclude, it can be stated that the calcanean articular facets of tali showed a wide variety of variations, being familiar with which may help in accounting the frequently encountered joint instability and arthritic changes in the vicinity of the talus.

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