



**The Variations in Calcaneal Articular Facets In North Indian Population  
and its Clinical Implication**

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**ABSTRACT**

**Aims and Objectives-** To know the most common type of calcanei in North Indian population and its clinical importance. There are three articular facets on superior surface of calcaneus- anterior, middle and posterior. Three types of calcanei are noted according to number and arrangement of the articular facets-type A, B and C. **Methodology -** The present study was done on 300 dry adult human calcanei of unknown sex taken from Department of Anatomy Sri Guru Ram Das Institute of Medical Sciences and Research Vallah (Amritsar). **Results-** In our study Type B was found as the most common type. Type A is the next most common. **Interpretation-** The talocalcaneal joint is important in arthritis and coalition, flat foot, valgus deformity, congenital anomalies and intra articular fractures.

**KEY WORDS-** calcaneus, anterior, talocalcaneal, valgus, congenital.

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**Introduction**

The calcaneus is the biggest and largest of all tarsal bones. It forms talocalcaneal joint having movement of inversion and eversion of foot<sup>1</sup>. The middle one third of upper surface of calcaneus has posterior talar facet for articulation with the body of talus. In the anterior one third distal and medial to sulcus calcanei, an articular area covers the sustentaculum tali. It articulates with the head of talus. In half of cases, it may be divided into anterior and middle articular facets<sup>2</sup>. The incidence of facets varies with race and sex<sup>2</sup>. Different workers have described the preponderance of different types of calcanei based on pattern of articular facets in different population<sup>3</sup>. Clinically the relation of talus and calcaneus should be well defined in congenital

clubfoot, subtalar instability, subtalar implants, valgus deformities<sup>5</sup>.

**Material and Methods**

The present study was done to know the most prevalent type of calcaneus in the North Indians depending on the number of articular facets on its superior surface. It consisted of 300 dry human calcanei without prominent pathology with unknown gender. The superior surface was carefully examined for the number of articular facets. The 3 types were considered. Type A (calcanei with 2 articular facets for talar head with four subtypes), Type B (calcanei with 2 articular facets coalescing in to a common articular facet with 2 subtypes) and Type C (calcanei with anterior, middle and posterior talar facets). Type A was divided into four subtypes depending on the

distance between the posterior border of anterior articular facet and anterior border of middle articular facets. The distance was measured with the sliding vernier caliper accurate to 0.1mm.

**Results**

Type A showed anterior and middle talar facets separated by a gap. Depending on degree of separation of these two joint facets, 4 subtypes were described

- ♣ A1= distance between anterior and middle talar facets was <2 mm.
- ♣ A2= distance between anterior and middle talar facets 2- 5mm.
- ♣ A3= distance between anterior and middle talar facets > 5mm.
- ♣ A4= only one joint facet known as anterior

talar facet.

In the present study, Type A was found in 126 calcanei (42%) out of which A1 was in 18 calcanei (6%) (10 right and 8 left), A2 was in 39 calcanei (13%) (21 right and 18 left),. A3 was seen in 48 calcanei (16%) (25 right and 23 left). A4 was in 21 calcanei (7%) (11 right and 10 left). In Type B there was no separation in between anterior and middle facet. So, calcaneus has 2 joint facet. Type B1- separation between 2 joint facet is not complete. Type B2- there was no separation between these 2 joint facets. There was only one smooth facet. Type C- there was no separation between these three joint facets. There was one joint facet. Type B was found in 168 calcanei (56%) out of which B1 Type was in 72 calcanei (24%) (31 right and 41 left). B2 type was found in 96 calcanei (32%) (54 right and 42 left). Type C was found in 6 calcanei (2% right and 6 left).

**Table1- Incidence and Percentage of different types of Calcanei according to the articular facets.**

S No.	Type	Sub type	No.	Percentage	Right	Left
1	A	-	126	42%	-	-
		A1	18	6%	10	8
		A2	39	13%	21	18
		A3	48	16%	23	25
		A4	21	7%	11	10
2	B	-	168	56%	-	-
		B1	72	24%	31	41
		B2	96	32%	54	42
3	C	-	6	2%	0	6

**Discussion**

Type B (56%) (fused anterior and middle facet) with B2 Subtype was found to be dominant in the present study. It was similar to other Indian worker studies<sup>4,6,7</sup> and also African studies<sup>3,8</sup>. In one study in Africans, high incidence of Type A was also found.<sup>9</sup> In Americans Type A is commoner than B<sup>10</sup>. All the above studies showed a definite correlation between calcaneal facet pattern and race. These racial differences are also observed in fetal series so these are thought to be genetically determined<sup>3</sup>. Calcanei with Type B facet configuration form more

stable subtalar joint than Type A<sup>10,5</sup>. Type A facet pattern cause more medial rotation of talar head on calcanei leading to unstable subtalar joint and consequent osteoarthritis<sup>10</sup>. For orthopaedic surgeons the interval between anterior and medial facet is important in osteotomy and interposition bone graft.<sup>15,14</sup> In Indians, Type B (fused anterior and middle facets) was more common so surgeons should be careful or a suitable modification of technique is required. It is also important in triple arthrodesis procedure for flat foot deformities.<sup>15</sup>



Fig 1–Showing Type B of Calcaneus



Fig 2-Showing Type A of Calcaneus

**Table2- Showing comparison of the results of different workers.**

S No.		A	A1	A2	A3	A4	B	B1	B2	C	T
1	Bunning and Barnett(1963) Indian	22					78				78
2	Jha and Singh (1972) Indian	294					504			2	800
3	Gupta et al (1977) Indian	31	9	4	13	5	67	28	39	2	401
4	Boonruangsri et al, (1992)Northeastern Thai	40	11	19	82		59	19	40	0.43	230
5	Uygun et al (2009) Turkish race	39.3	4	13	17	5	58	25	33	22	
6	Present Study(2012) Indian	42	6	13	16	7	56	24	32	2	300

### Conclusion

In the present study done on North Indian population showed Type B facet configuration as most common. Type A is the next most common. This is clinically important as modification of various surgical techniques applied to North Indian is mandatory. They are also at a greater risk of developing subtalar arthritis due to Type B pattern.

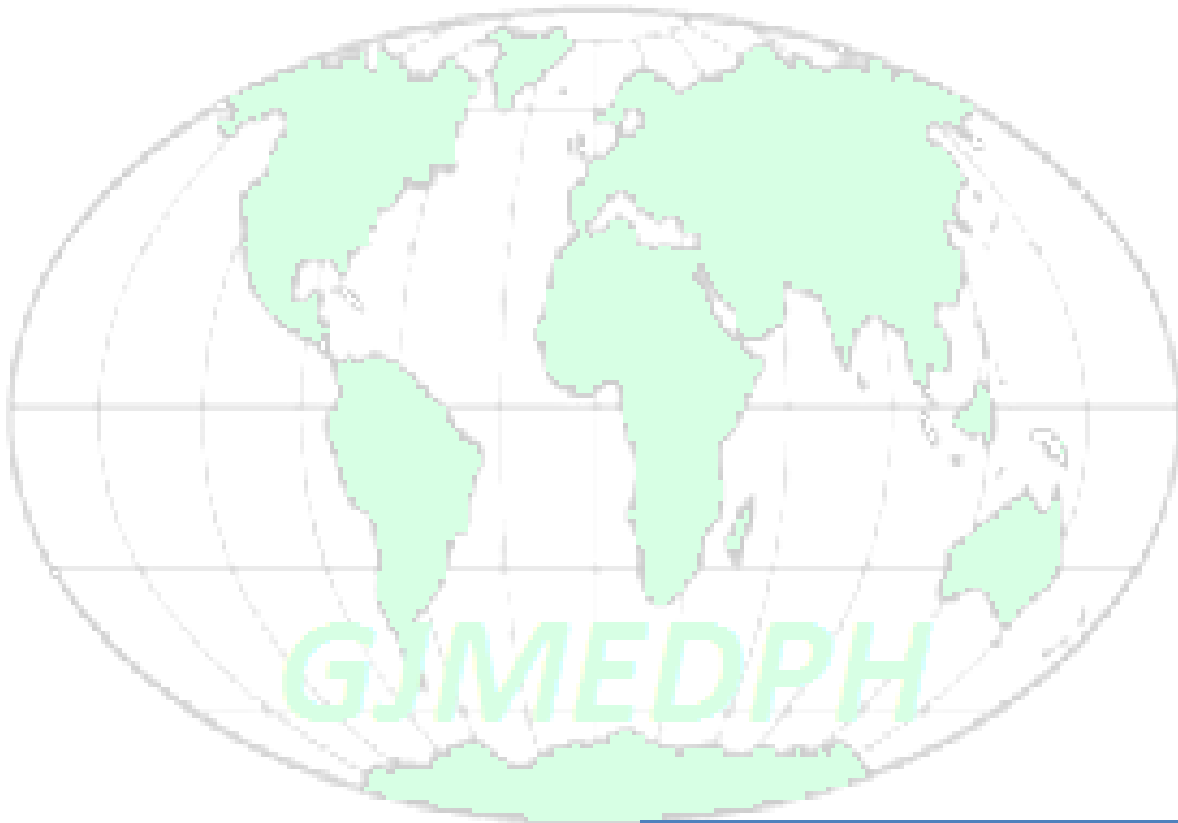
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