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# MORPHOMETRY OF ARTICULAR FACETS OF TALUS AND ANATOMICAL VARIATIONS OF THE TROCHLEAR SURFACE IN NORTH INDIAN POPULATION

Anatomy

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## ABSTRACT

**Introduction** Talus forms one of the important bones of the longitudinal arch of foot and is responsible for reception of body weight and its transmission to plantar surface. Number of facets are found on talus.

**Material and method** 70 tali, from Department of Anatomy, GMC, Jammu were collected. Measurements on trochlear surface, on lateral and medial facet were made.

**Result** On superior articular surface, mean values of medial, central and lateral length were 27.0cm, 28.1cm, 27.4cm on right side and 29.4cm, 27.0cm, 29.1cm on left side. Mean anterior, central and posterior widths were 27.6cm, 26.2cm, 21.1cm on right side and 27.0cm, 24.0cm, 23.1cm on left side. Mean central height on medial articular surface was 13.6cm on right side and 10.8cm on left side. Mean central width on medial articular surface was 25.9cm on right side and 17.9cm on left side.Mean central height on lateral articular surface was 26.2cm on right side and 23.0cm on left side. Mean central width on lateral articular surface was 21.9cm on right side and 16.8cm on left side.

**Conclusion** Value of present study is different from other studies because of inherent population variations due to environmental and genetic factors.

## KEYWORDS

Talus, lateral facet, genetic.

## INTRODUCTION

The studies are increasing on remains of human skeleton. They can be either morphometric or morphological (1). Various morphological features have been used by various workers for studying anatomical variations from individual bones. Study regarding morphological features of the bones such as mandible (2), pelvis (3), sternum (4), clavicle (5), scapula (6) have been done. Modifications can occur in the articular morphology of the human skeleton by stresses imposed on it (7,8).

Talus, a tarsal bone of the foot, forms one of the important bones of the longitudinal arch of foot.It is responsible for reception of body weight and its transmission to plantar arch. It is the only tarsal bone which is devoid of muscular or tendinous attachments (9).

Talus possesses three articulating surfaces. They are a flat surface on its anterolateral surface; on the posterior aspect is the oval surface which articulate with sustenticulum tali of calcaneum bone. The third facet articulate with spring ligament covered by articular cartilage. This facet lies medial to the above two facets (10).The trochlear surface of tali is convex parasagittally and concave transversely, being wider in front. The articular surface for medial malleolus on talus is coma shaped and anteriorly, it is deeper. The lateral talar surface is vertically concave and triangular in shape (11). The knowledge of these articular surfaces help in designing the ankle implants and are fruitful in total ankle replacements (12,13,14).

Squatting alters the morphology of the lower limb (7,8). A number of squatting facets are found on talus. Anterior extensions of malleolar surfaces and trochlear surfaces of tali may be present. There is no association between these extensions and modifications of the anterior margin of the distal tibia (15).

In our study, morphometric study of the articular facets of the talus has been done. The anatomical variations in the trochlear surface of the talus has been studied.

## OBJECTIVE OF THE STUDY

Main objective of the study was to do the morphometric study of the articular facets of the talus and observe the anatomical variations in tali. Moreover, knowledge regarding the anatomy of talus with variations can help in reconstruction of foot.

## MATERIAL AND METHOD

The study was conducted on 70 tali, which were collected from the Department of Anatomy, Government Medical College, Jammu with permission. Anatomical measurements were done using vernier calliper. 40 tali were of right side and 30 were from left side. Following parameters were taken:

1. On the trochlear surface: medial length, central length, lateral length, anterior width, central width, posterior width.
2. On the lateral facet: central width, central height.
3. On the medial facet: central width, central height.
4. Medial, lateral and both medial and lateral extensions was noticed in tali.

## RESULTS

On superior articular surface, mean values of medial, central and lateral length were 27.0cm, 28.1cm, 27.4cm on right side and 29.4cm, 27.0cm, 29.1cm on left side. Mean anterior, central and posterior widths were 27.6cm, 26.2cm, 21.1cm on right side and 27.0cm, 24.0cm, 23.1cm on left side (Table 1) (Fig 1a) (Fig 1b).

**Table 1: Mean of the articular facet on superior articular surface of body of talus**

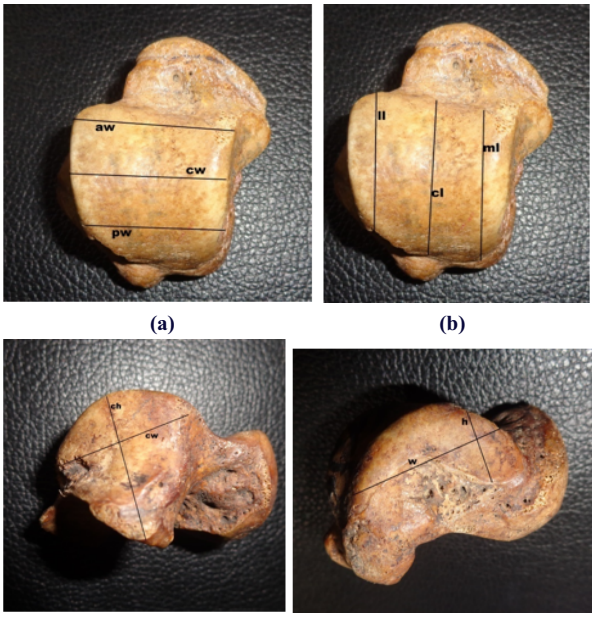
| Trochlear surface of talus | | |
|---|---|---|
| **Parameter** | **Right side (mean value)** | **Left side (mean value)** |
| **Medial length(ml)** | 27.0 | 29.4 |
| **Central length (cl)** | 28.1 | 27.0 |
| **Lateral length(ll)** | 27.4 | 29.1 |
| **Anterior width (aw)** | 27.6 | 27.0 |
| **Central width (cw)** | 26.2 | 24.0 |
| **Posterior width (pw)** | 21.1 | 23.1 |

**Table 2: Mean of measurements of articular facet on lateral surface of talus**

| Lateral articular facet | | |
|---|---|---|
| **Parameter** | **Right side (mean value)** | **Left side (mean value)** |
| **Central height (ch)** | 26.2 | 23.0 |
| **Central width (cw)** | 21.9 | 16.8 |

**Table 3: Mean of measurements of articular facet on medial surface of talus**

| Medial articular facet | | |
|---|---|---|
| **Parameter** | **Right side (mean value)** | **Left side (mean value)** |
| **Central height (h)** | 13.6 | 10.8 |
| **Central width (w)** | 25.9 | 17.9 |




(a) (b)

(c) (d)

**Fig 1: Showing measurements of articular facets of talus. (a) and (b) Superior articular surface, (c) Triangular facet on lateral surface, (d) Coma shaped facet on medial surface**

Lateral articular surface: Mean central height on the lateral articular surface was 26.2cm on the right side and 23.0cm on the left side. Mean central width on the lateral articular surface was 21.9cm on the right side and 16.8cm on the left side (Table 2) (Fig 1c).

Medial articular surface: Mean central height on the medial articular surface was 13.6cm on the right side and 10.8cm on the left side. Mean central width on the medial articular surface was 25.9cm on the right side and 17.9cm on the left side (Table 3) (Fig 1d).

**Table 4: Incidence of various anatomical variations of trochlear surface**

| Anatomical variations of trochlear surface of talus | No. of cases |
|---|---|
| Medial extension | 20 |
| Lateral extension | 16 |
| Both Lateral and Medial extensions | 34 |
| Total number of cases | 70 |


**Fig 2: Both medial and lateral extensions of talus (a), Medial extension of talus (b), Lateral extension of talus (c).**

The presence of medial extension in 20 tali shows that continuous modelling of bone is taking place and this is a feature of human development. There is disparity in the trochlear extensions between different populations because their presence not being determined by same factor. Due to biochemical demands of increased weight bearing, the framework of talus might change (16) (Table 4)(Fig 2).

## DISCUSSION

During forensic science and archaeological excavations, talus is used to determine unknown skeleton remains due to its durability (17). Ilhan Otag (19) found that mean values of trochlear breadth, trochlear length and talar width were 31.69mm, 33.45mm and 40.79mm on right side and 31.72mm,34.12mm and 43.39mm on left side respectively and these values were less than the present study.

The shape of the talus appears to be independent of age and sex, in respect of the curvatures of the trochlear surface (20). In the adult series, forward prolongation of lateral and medial articular surfaces of talus upon talar neck is common (21).

## CONCLUSION

Trochlear articular surface of talus is wider in front. Mean values of the present study are different as compared to other studies which may be due to inherent population variations because of environmental and genetic factors. During talus replacement surgery, measurements of opposite talus can be used as control. It may be of help to surgeons to design talar implants and prosthesis (22).

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