

Oral presentation

## Ankle morphometry in the Chinese population

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### Introduction

Modern designs are now contributing to a remarkable renewed interest in total ankle arthroplasty (TAA), but TAA is still not as successful as total hip and total knee arthroplasty [1]. Among the remaining issues there is the design of the prosthesis components, which are often claimed to be 'anatomical' or compatible with the bony and ligament structures. However, very little is reported in the literature about the morphology of the distal tibia and proximal talus. Not a single is dedicated to the ankle morphological parameters in the Chinese population, which are expected to be addressed particularly in prosthesis designs dedicated to meeting the requirements of oriental life style. The purpose of the current study was to bridge the gap.

### Methods

Ten ankle/foot cadaver specimens without any trauma or disease (mean foot length: 22 cm) were used in the current study. Each specimen was positioned at the neutral position and fixed to a plastic frame before receiving a computerized tomography (CT) scan at a slice thickness of 0.6 mm. The CT data were then used to reconstruct the 3D model of the bones and a MATLAB program was implemented with Geomagic STUDIO to obtain the morphological parameters of the distal tibia and proximal talus, Figure 1.

### Results

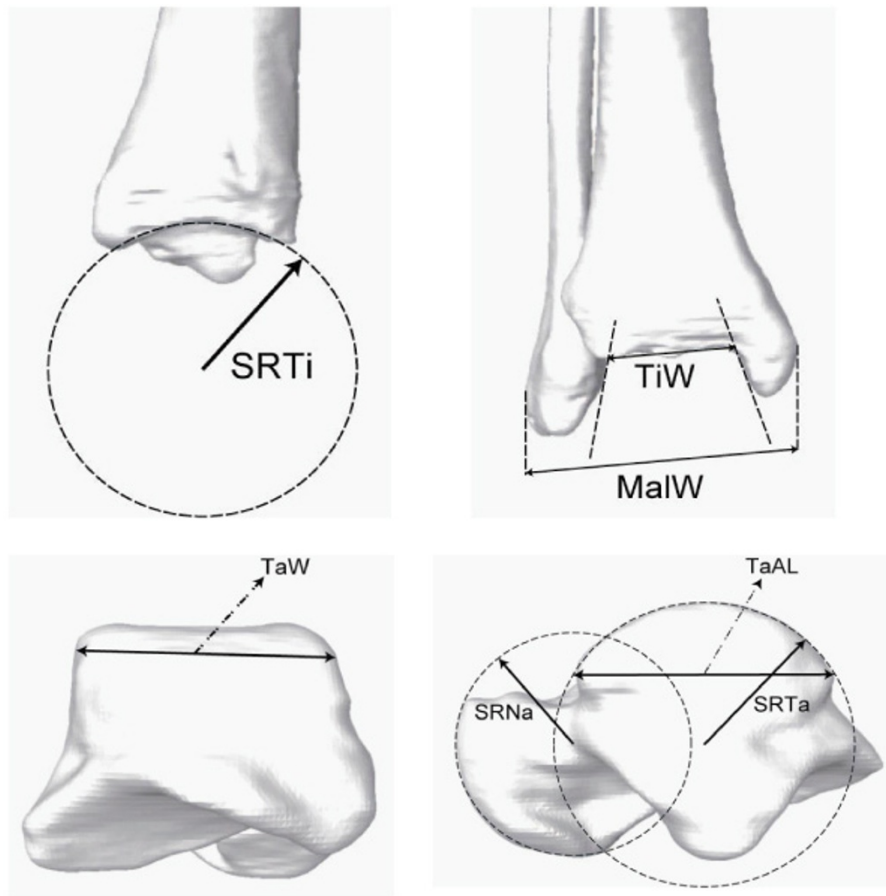
The morphometrical measurements obtained (Table 1) are all smaller than those in a recent study [1], except for TaW, SRTi and Tiw. The observed relatively smaller bone mass of the distal tibia in the Chinese population suggests that the current tibial components might not be suitable for this bone in this population, and that stress fractures at the medial and lateral malleoli [2] may occur more frequently.

### Conclusion

The success of an ankle prosthesis design depends largely on the morphological data from the ankle joints of its targeted population. The measurements in the current study are expected to contribute to the design of surgical instruments and in particular of the dimensions for the different

**Table 1: Mean, standard deviation, maximum, minimum, median values for all 8 measurements of the ankle joint for the 10 subjects analysed**

	Mean	S.D.	Max	Min	Median
Volume(cm <sup>3</sup> )	30.01	3.88	35.74	25.55	29.81
SRTa(cm)	2.21	0.27	2.67	1.83	2.09
SRNa(cm)	1.70	0.14	1.88	1.49	1.75
TaW(cm)	2.99	0.21	3.35	2.63	2.96
TaAL(cm)	3.23	0.29	3.76	2.85	3.20
SRTi(cm)	2.98	0.79	4.75	2.00	2.92
MalW(cm)	6.15	0.28	6.64	5.82	6.08
TiW(cm)	3.19	0.24	3.67	2.82	3.17



**Figure 1**

Morphological parameters measured: talar width (TaW), tibial width (TiW), radii of the trochlea tali (TaAL) and the tibial morsa-tise (SRTi), trochlea tali length (TaAL), inter-malleolus distance (MaIW).

prosthesis component sizes, which were revealed to be under dimensioned. This is particularly true in post-traumatic ankles, where bones are larger than in normal ankles.

## References

1. Stagni R, et al.: *J Biomech* 2004, **37**(7):1113-8.
2. Kumar Arun, Dhar Sunil: *Foot and ankle surgery* 2007, **13**:19-23.

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