Excessive anterior cruciate ligament (ACL) force and distorted joint surface motion (kinematics) are components of tibiofemoral joint (TFJ) mechanics hypothesized as links to ACL injury and Osteoarthritis (OA) [1]. Several studies have investigated ACL injury mechanisms and gender differences by examining in vivo kinematics of anterior tibial translation and TFJ surface rolling and gliding using a 2-D geometric computational TFJ model (based on group cadaver knee geometry measures) during weight bearing and non-weight bearing activities in healthy and ACL injured knees. [2-6]. TFJ internal skeletal dimensions have not been determined previously in vivo from computed (CT) image data for use in creating skeletal based subject specific computational knee models.

OBJECTIVES

- Obtain TFJ internal skeletal dimensions from CT scan based solid 3-D knee images for use in creating a skeletal based subject specific computational knee model.
- Conduct intertester reliability analyses for the internal skeletal dimensions.

METHODS

- Subjects
  - Ten healthy adults, 4 men and 6 women, participated in this study (mean age 25.5±2.5; mean height 169.7 cm; mean body mass 74.9±14.9 kg).
  - Subjects did not have a history of lower extremity or spine pain, injury, surgery, musculoskeletal disease, or neurological disease within the past year.

- Procedure
  - TFJ CT image data was converted to triangulated surface models using Materialize Mimics software version 13.1. TFJ CT image data for use in creating skeletal based subject specific computational knee models.
  - Subjects did not have a history of lower extremity or spine pain, injury, surgery, musculoskeletal disease, or neurological disease within the past year.

- Data Analysis
  - Twenty-four internal skeletal dimensions (Tables 3 and 4) were measured from the TFJ CT image data of the femur and tibia.

RESULTS

- Internal skeletal dimension intertester reliability was fair to good. Only nine of twenty eight dimensions had low ICC values [ICC(1, K) < 0.7] between the two testers (Tables 5 and 6).

CONCLUSIONS

- In this study, internal skeletal dimensions from CT image based solid 3-D TFJ models were used to mathematically describe TFJ geometry. High consistency was observed for most of the measured dimensions. The primary reason for the lower intertester correlation coefficients on some of the dimensions may be due to inconsistent identification of skeletal landmarks. We believe refinement of the skeletal landmark definitions and improved training and additional experience of testers can improve the intertester reliability.