Anthropometric Differences in Natural Posterior Tibial Slope

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Disclosures:
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Introduction: The posterior inclination of the proximal tibial surface, or posterior tibial slope (PTS), has been found to be related to the anteroposterior stability of the natural knee joint [1]. Understanding the ethnic and gender variability of the natural PTS may provide insight on global variation of the natural knee kinematics. This study investigated gender and ethnic differences of the medial and lateral PTS among multiple ethnicities (Caucasian, Korean, Chinese, Indian, and Japanese), and the impact on the measurement of sampling location on the tibial plateau.
Methods: Digital models of 597 healthy right tibias (194 Caucasian, 80F/114M; 87 Korean, 46F/41M; 118 Japanese, 69F/49M; 100 Chinese, 50F/50M; 98 Indian, 48F/50M) were used in this study. A sagittal plane was defined on each tibia by the mechanical axis and the neutral rotational axis (line connecting medial third tubercle and the PCL attachment site). The medial and lateral PTS were measured as the sagittal angles between the line perpendicular to the anatomical axis, which was defined as the center line passing through the inner cortex region between 10cm and 20cm distal to the tibial plateau [2], and the lines tangent to anterior and posterior cortical border of the medial and lateral plateaus at 20% ML location from medial and lateral border of the tibia plateau. Ethnic and gender variability in medial and lateral PTS were investigated. Four additional medial-lateral (ML) locations (16%, 18%, 22%, 24%) were sampled to assess their impact on the PTS

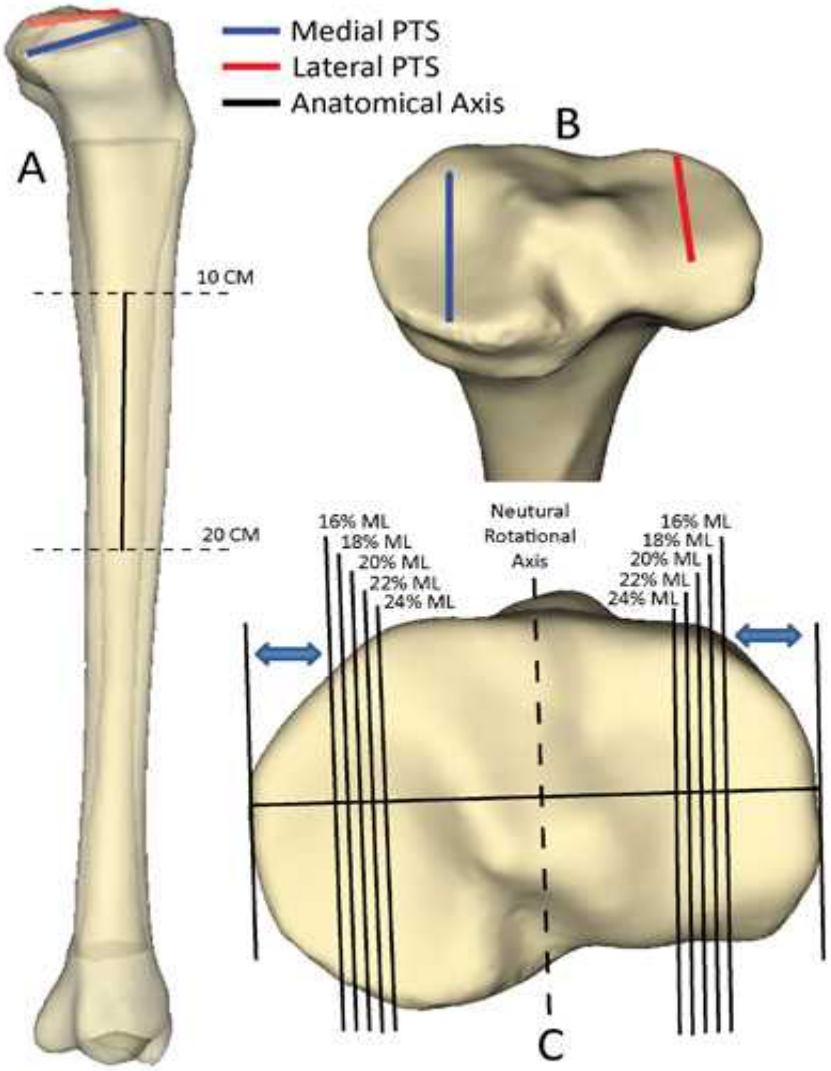

Figure 1. A, B) A representative tibia showing medial and lateral tangent lines on the tibial plateau. Definition of anatomical axis is also shown. C) Illustration of varying ML sampling location on the tibial plateau for the tangent lines.

measurement.

Results: Medial and lateral PTS for each ethnicity are shown in Fig. 2 with significant differences marked. The biggest differences in means were found between Korean (15.8°) and Caucasian (12.3°) for medial PTS (difference = 3.5°), and between Indian (13.0°) and Japanese (9.1°) for lateral PTS (difference = 3.9°). A gender difference was not found in either the medial or lateral PTS across all ethnicities. Mean lateral PTS decreased when the sampling location moved towards the center of the tibia (Fig. 3), while the opposite trend was found for mean medial PTS. On average, changing the ML sampling location from 16% to 24% resulted in 0° to 2.2° differences in lateral PTS and 0.2° to 1.1° differences in medial PTS, depending on

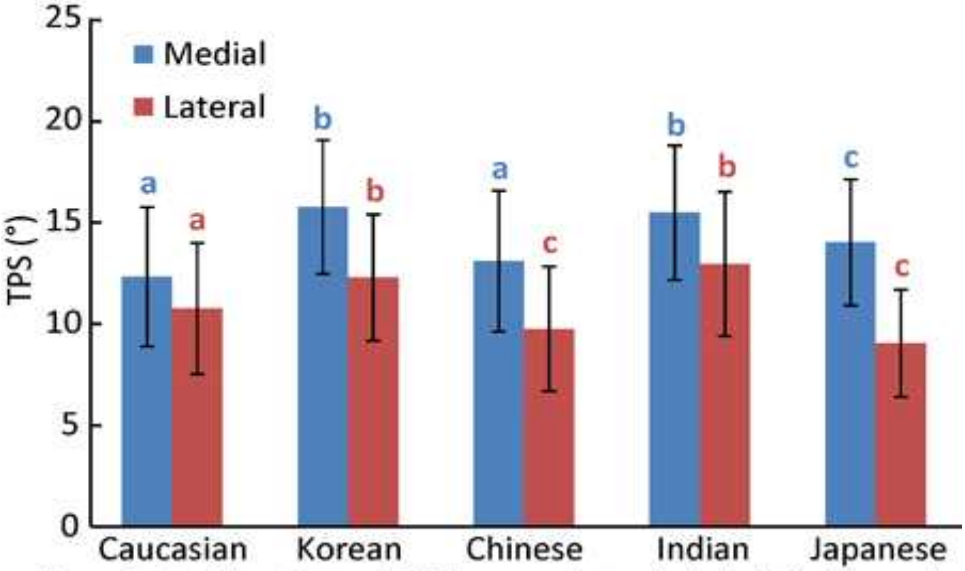

Figure 2. Medial and lateral PTS (mean and standard deviation) for each ethnicity. Different letters indicate statistical differences between ethnicities for medial (blue) or lateral (red) PTS.

ethnicity.

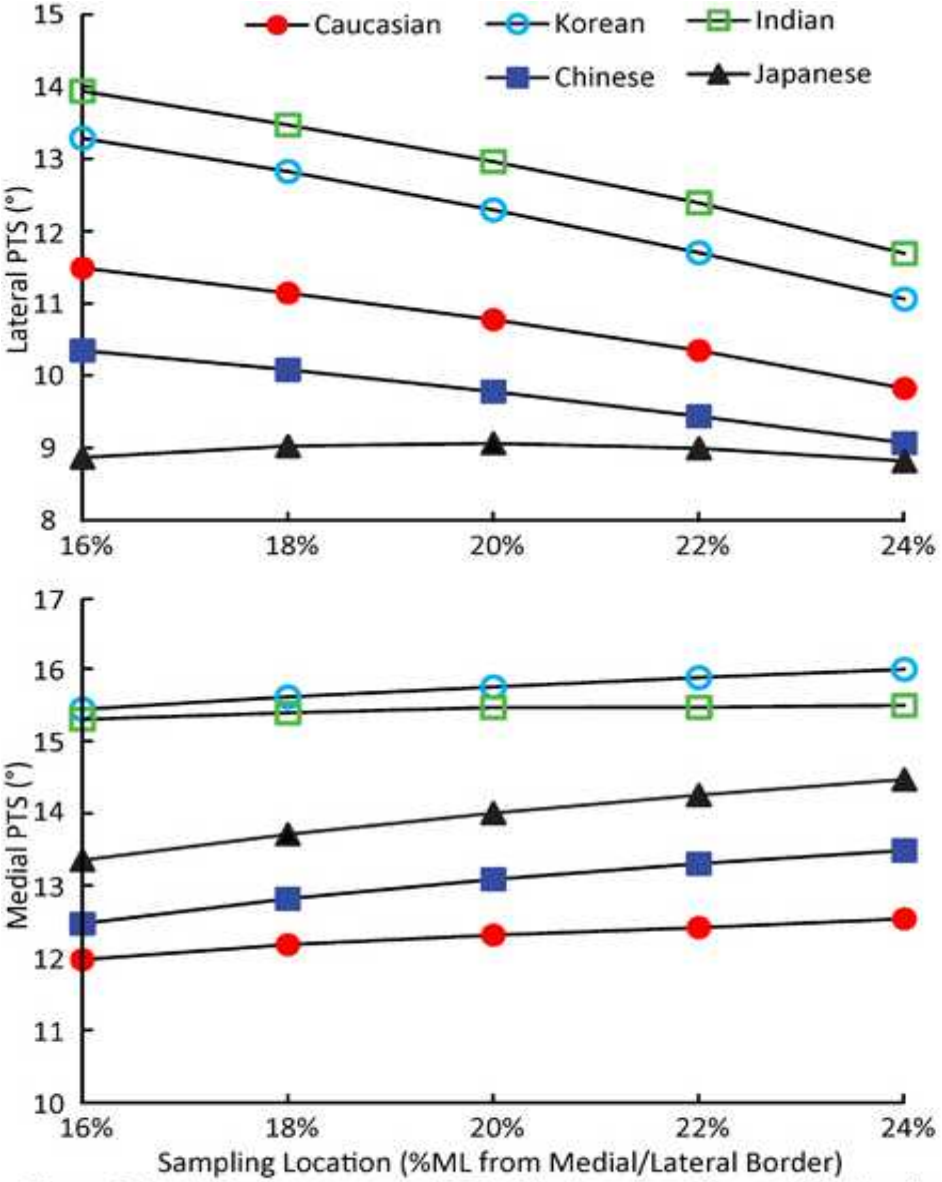

Figure 3. Variation on measured PTS with changing ML sampling location for each ethinicity.

Discussion: Ethnic, but not gender differences, were found for PTS on both plateaus. The results may aid in the understanding of

differences in populations in knee joint kinematics. The sensitivity to PTS on ML sampling location may indicate that variation in varus/valgus alignment during medical imaging may potentially impact ML sampling location due to slight changes of tibial morphology in the sagittal view, therefore leading to possible variations in PTS measurement.

Significance: Assessing ethnic or gender variability in posterior tibial slope (PTS) may aid in the understanding differences in knee joint kinematics within global populations.

Acknowledgments: N/A

References: [1] Giffin et al., Am J Sports Med; 2004; 32: 376-82

[2] Bae et al., Int Orthop. 2012 Apr;36(4):755-60

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