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Structural and Biomechanical Basis for Differences in Vertebral Fracture in Chinese and Caucasians. Y. Du1, X. Wang1,2, C.H. Turner1, C. Fong1, E. Seeman1. 1Endocrinology, Austin & Repatriation Medical Centre, The University of Melbourne, Melbourne, Australia, 2The Biomechanics and Biomaterials Research Centre, Indiana University, School of Medicine, IN, USA.

We hypothesized that the structural abnormalities predisposed to vertebral fracture are similar in Chinese and Caucasians, accounting for the similar vertebral fracture rates between races. We studied 687 healthy Chinese (449 females) and 1088 healthy Caucasians (738 females) aged 18 to 92 yrs. Vertebral body (VB) cross-sectional area (CSA) and volumetric BMD (vBMD) excluded posterior elements were measured using dual x-ray absorptiometry by postero-anterior and lateral scanning. We calculated VB stress (dose/CSA) and FRI (load/strength) during bending forward. In young adulthood, VB stress did not differ by either sex because the lower load (10-14%) in Chinese was distributed on a proportionately lower CSA (13-14%) than in Caucasians. However, vBMD was 9-13% higher in Chinese than Caucasians, conferring 12-19% lower FRI in Chinese men and women. Aging was associated with increased CSA in both Chinese and Caucasian men and women. However, racial differences in peristomial expansion were minimal, increasing by 8.7% and 11.8% in elderly Chinese and Caucasian men, and increasing by 5.6% and 5.7% in elderly Chinese and Caucasian women (both no significant difference in each other). VB stress decreased similarly in Chinese and Caucasian men (13.3% vs 13.7%) but decreased more in Chinese than Caucasian women (10.0% vs 5.5%, p < 0.01). Net decline in vBMD was greater in elderly Chinese than Caucasian women (33% vs 27%, p < 0.01) but similar in Chinese and Caucasian men (11% vs 12%). These structural changes were captured by FRI; a similar proportion of elderly Chinese and Caucasian men (5% vs 6%) and women (25% vs 29%) had the FRI > 1. The results are consistent with the notion that vertebral fractures occur more commonly in women than in men but similar proportions of Chinese and Caucasians (of either sex) sustain fractures.

Disclosures: Y. Du, None.

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Structural Basis for Differences in Femoral Neck Fracture in Chinese and Caucasians. X. Wang1,2, Y. Du1, T. J. Beck3, E. Seeman1. 1Endocrinology, Austin & Repatriation Medical Centre, The University of Melbourne, Melbourne, Australia, 2Radiology, The Johns Hopkins University, School of Medicine, Baltimore, MD, USA.

We hypothesized that structural characteristics may be better maintained in Chinese than Caucasians in old age, accounting for the lower hip fracture rates reported in epidemiological studies. A faster rate of peristomial apposition maintains bending strength, while a slower rate of peristomial expansion with a slower rate of endocortical resorption should reduce the increased risk of buckling with age. We measured femoral neck (FN) dimensions and bone mass using DXA, estimated endocortical diameter, cortical thickness, section modulus (a measure of bending strength), and bucking ratio (subperiosteal radius/cortical thickness) in 738 Chinese (490 females) and 1181 Caucasians (788 females) aged 18 to 93 years. In young adult women, after adjusting for racial differences in height and weight, FN axis length and diameter remained 4-8% lower in Chinese, while cortical thickness and vBMD were no different by race. Thus, growth produced racial differences in FN geometry; the same cortical thickness was distributed further from the FN neural axis conferring 22.3% greater bending strength in Caucasians than Chinese. However, bucking ratio was 5.2% lower in Chinese than Caucasian women. In young adult men, bending strength was 12.5% lower while bucking ratio was no different in Chinese compared to Caucasians. From young (~30yrs) to old age (~70yrs), FN peristomial diameter (height and weight adjusted) increased less in Chinese than Caucasian males (1.0% vs. 9.1%), but increased similarly in Chinese and Caucasian women (4.6% vs. 3.3%). Endocortical diameter also increased less in Chinese than Caucasian men (2.0% vs. 12.5%), but similarly in Chinese and Caucasian women (8.5% vs. 6.5%). Consequently, bending strength decreased by 6.9% in Chinese men but maintained in Caucasian men, while bending strength decreased similarly in Chinese and Caucasian women (4.0% vs. 6.9%). Bucking ratio increased less in Chinese than Caucasian men (14.5% vs 28.4%) but increased similarly among Chinese and Caucasian women (28.8% vs 31.2%). These changes produced 17.4-25.0% lower bending strength and 6.9-37.7% lower buckling ratio in elderly Chinese than Caucasians in both sexes. We concluded that despite the smaller FN diameter and lower bending strength, the normally thicker cortex and narrower diameters in elderly Chinese suggest a lower risk of structural failure by local buckling than Caucasians. These racial differences in Chinese and Caucasians are likely to be established during both aging.

Disclosures: Y. Du, None.