osteoporosis therapy after an AFF. A bone anabolic agent may be considered as AR treatments prior to the AFF or continued thereafter is a risk for a second AFF.

OC16
LONGITUDINAL CHANGES IN BONE STRUCTURE AS ASSESSED BY PERIPHERAL QUANTITATIVE COMPUTED TOMOGRAPHY AND RELATIONSHIPS WITH MUSCLE HEALTH IN OLDER MEN AND WOMEN

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Objective: Cross-sectional analyses have shown strong associations between muscle size and both bone geometry and strength. There is little data on the effect of muscle size on changes in bone structure over time. We investigated this using a well phenotyped cohort of older men and women.

Materials and Methods: We studied 194 men and 178 women from the Hertfordshire Cohort Study each of which underwent peripheral quantitative computed tomography (pQCT) of the radius (66 %) and tibia (14 %) in 2004–5 and then again in 2011–12. Percentage change per year was calculated for muscle cross-sectional area (CSA) and diaphyseal bone parameters (total area (Tt.Ar), cortical area (Ct.Ar), cortical density (Ct.BMD), and polar stress strain index (SSIp)). These were then transformed using the Fisher-Yates rank-based inverse normal transformation to create sex-specific z-scores. Relationships between muscle and bone parameters were assessed using linear regression.

Results: The mean(SD) age of men and women at baseline was 68.9 and 69.3 years respectively. Mean(SD) follow-up time was 7.17(0.39)y. Tt.Ar increased with age and at a greater rate in men than women in the radius (median: men 1.53 %/year, women 0.94 %/year, $p < 0.001$). In both the radius and tibia, Ct.Ar reduced more rapidly in women than men (radius median: men 0.17 %/year, women 0.49 %/year, $p < 0.001$). Rates of muscle loss were similar in men and women (forearm: men 0.75 %/year, women 0.71 %/year $p = 0.424$). In men, rate of loss of Ct.Ar was positively associated with rate of loss of muscle CSA (β(95%CI): radius 0.31(0.17,0.45) $p < 0.001$; tibia 0.18(0.03,0.33), $p < 0.05$). A similar trend was shown in women but did not reach significance. Baseline muscle CSA was not associated with the rate of change in Ct.Ar.

Conclusion: Changes in diaphyseal bone structure with age differ in men and women. In men, the rate of loss of Ct.Ar is associated with rate of loss of muscle CSA and not its baseline level. This suggests that interventions to maintain muscle mass may help to ameliorate the age-related deterioration in bone health.

OC17
RELATIONSHIP BETWEEN TOTAL HIP BMD T-SCORE AND INCIDENCE OF NONVERTEBRAL FRACTURE WITH UP TO 10 YEARS OF DENOSUMAB (DMAB) TREATMENT

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Objective: Investigate the relationship between total hip (TH) BMD T-score and nonvertebral fracture (NVFX) incidence through 10 years of DMAb therapy.

Materials and Methods: The analysis included women who received DMAb during FREEDOM and those who continued to receive DMAb for up to an additional 7 years in FREEDOM Extension ($N = 3{,}612$; maximum of 10 years continuous treatment). A repeated-measures model was used to estimate each subject's TH BMD T-score time course during the entire study and estimate TH BMD T-score at each unique NVFX time among all subjects at risk. A Cox's proportional-hazards model was then fitted, with time to NVFX as response and TH BMD T-score time course a time-dependent covariate.

Results: Incidence of NVFX was lower with higher TH BMD T-score (Fig). For example, TH BMD T-scores of −2.5 and −1.5 were associated with 1-year NVFX incidence of approximately 3 and 2 %. Further increments in T-scores above −1.5 had minimal impact on further reducing NVFX incidence. The inverse relationship between TH BMD T-score and NVFX incidence was maintained regardless of age or prior FX (data not shown).

Conclusion: Higher TH BMD T-scores achieved during up to 10 years of DMAb treatment were associated with a lower expected incidence of NVFX, similar to the relationship previously established in treatment-naïve patients [Austin *JBMR* 2012]. Our findings suggest that BMD level during treatment is more important for fx risk reduction than the magnitude of the change from baseline BMD levels. Moreover, our findings support the concept that a specific T-score, perhaps in the range of −2.0 to −1.5, can be considered a therapeutic goal with DMAb treatment.

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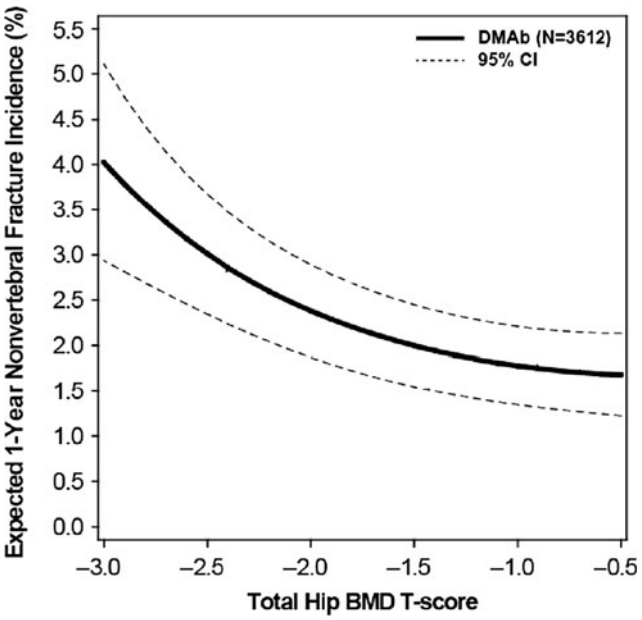

OC18

VITAMIN D MEASUREMENT STANDARDIZATION: THE WAY OUT OF THE CHAOS

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What constitutes "vitamin D inadequacy" is unclear. Huge numbers of people either do, or do not, have this condition which may, or may not, cause multiple diseases. This chaos ensues from deficient understanding of what constitutes "inadequacy." Resolving this situation requires excellence in measurement of serum total 25-hydroxyvitamin D [25(OH)D], the recognized standard for defining an individual's vitamin D status. Failure to standardize 25(OH)D measurement precludes developing consensus cutpoints to define vitamin D status. To address this situation the Vitamin D Standardization Program (VDSP) developed a reference measurement system, based on gold standard procedures, i.e. NIST and Ghent University, to standardize current and future research by use of 25(OH)D assays traceable to these standards. Importantly, VDSP also developed methodology for standardizing prior research; past studies can obtain calibrated 25(OH)D values by re-measuring a statistically defined subset of stored serum samples. The effect of such retrospective standardization on prevalence of "low" vitamin D status in large national studies is reported here. Original values for the US NHANES III (1988–1994) dataset were calibrated by re-measuring 25(OH)D in a small subsample (~2.7 %; $n = 505$) of the overall cohort. Standardized 25(OH)D results were lower than original values; as such the percentage of participants age 12+ with values below often utilized cutpoints (30, 50 and 75 nmol/L) increased from 4 to 6 %, 22 to 31 % and 55 to 71 %. The same methodology was applied to the German national KIGGS survey. Re-measurement of 25(OH)D in ~4.1 % ($n = 160$) led to higher standardized results (especially for those < ~50 nmol/L) so that the proportion below 30, 50, and 70 nmol/L decreased from 28 to 13 %, 64 to 47 % and 87 to 85 % respectively. In conclusion, retrospective 25(OH)D standardization can be applied to previously completed vitamin D studies that have stored serum specimens. These examples underscore the challenges (perhaps impossibility) of developing vitamin D guidelines using unstandardized 25(OH)D data. As a way forward we suggest an international effort to identify key prior studies with stored samples for re-analysis and standardization. The initial focus of this effort could be defining the 25(OH)D level associated with vitamin D deficiency (rickets/osteomalacia). Subsequent work could focus on defining inadequacy. Failure to take such an approach seems destined to maintain the current (chaotic) status quo. Finally, the examples reported here highlight the fallacy of conducting meta-analyses with unstandardized 25(OH)D data. We suggest suspending publication of meta-analyses based on unstandardized 25(OH)D results.

OC19

DETERMINANTS OF THE MATERNAL RESPONSE TO VITAMIN D SUPPLEMENTATION DURING PREGNANCY: THE MAVIDOS TRIAL

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