A-15: Influence of poorly mineralized trabecular bone matrix on relative bone stiffness and strength on aging and in osteoporosis

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The clinically most important condition mainfested by changes in quality of bone is osteomalacia, which consists of several disorders in which there is a defect in, or failure of, bone mineralization. many studies have demonstrated changes in mineralized quality of bone matrix both on ageing and in disease. However, the contribution of osteomalacia to diminishing mechanical competence of fracture sites such as vertebrae is not known.

To investigate effects of poorly mineralized matrix on strength and stiffness of bone, mechanical competence of trabecular bone was tested before and after removal of unmineralized matrix.

Plane parallel precise 4 mm thick sagittal sections of trabecular bone from 4th lumbar vertebral bodies of 16 male and 8 females aged from 30 to 89 years were used to compare the stiffness before and after removal of unmineralized bone matrix. The samples were treated with hydrogen peroxide to remove unmineralized matrix collagen and a universal testing machine (Hounsfield H25K) was used for the testing of stiffness.

The findings demonstrated that unmineralized bone matrix makes an important contribution to the stiffness and strength of lumbar vertebrae, irrespective of age, and in both males and females. The relative reduction is stiffness after treatment with hydrogen peroxide, found in all age groups increased with age. The change was greatest in osteoporotic samples, indicating the importance of poorly mineralized bone patches in the pathogenesis of osteoporotic fractures.