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Age- and gender-related changes in the cellularity of human bone marrow and the prevalence of osteoblastic progenitors

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Abstract

Bone marrow harvested by aspiration contains connective tissue progenitor cells which can be induced to express a bone phenotype in vitro. The number of osteoblastic progenitors can be estimated by counting the colony-forming units which express alkaline phosphatase (CFU-APs). This study was undertaken to test the hypothesis that human aging is associated with a significant change in the number or prevalence of osteoblastic progenitors in the bone marrow. Four 2-ml bone marrow aspirates were harvested bilaterally from the anterior iliac crest of 57 patients, 31 men (age 15–83) and 26 women (age 13–79). A mean of 64 million nucleated cells was harvested per aspirate. The mean prevalence of CFU-APs was found to be 55 per million nucleated cells. These data revealed a significant age-related decline in the number of nucleated cells harvested per aspirate for both men and women ($P = 0.002$). The number of CFU-APs harvested per aspirate also decreased significantly with age for women ($P = 0.02$), but not for men ($P = 0.3$). These findings are relevant to the harvest of bone marrow derived connective tissue progenitors for bone grafting and other tissue engineering applications, and may also be relevant to the pathophysiology of age-related bone loss and post-menopausal osteoporosis.