Increased oxidative stress response in granulocytes from older patients with a hip fracture may account for slow regeneration.

Abstract:
Proximal femur fracture, a typical fracture of the elderly, is often associated with morbidity, reduced quality of life, impaired physical function and increased mortality. There exists evidence that responses of the hematopoietic microenvironment to fractures change with age. Therefore, we investigated oxidative stress markers and oxidative stress-related MAPK activation in granulocytes from the young and the elderly with and without fractured long bones. Lipid peroxidation levels were increased in the elderly controls and patients. Aged granulocytes were more sensitive towards oxidative stress induced damage than young granulocytes. This might be due to the basally increased expression of SOD-1 in the elderly, which was not further induced by fractures, as observed in young patients. This might be caused by an altered MAPK activation. In aged granulocytes basal p38 and JNK activities were increased and basal ERK1/2 activity was decreased. Following fracture, JNK activity decreased, while ERK1/2 and p38 activities increased in both age groups. Control experiments with HL60 cells revealed that the observed p38 activation depends strongly on age. Summarizing, we observed
age-dependent changes in the oxidative stress response system of granulocytes after fractures, for example, altered MAPK activation and SOD-1 expression. This makes aged granulocytes vulnerable to the stress stimuli of the fracture and following surgery.