Stress control by shape memory alloys at bone fracture healing

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Abstract

The application of shape memory alloys in medicine opens the opportunity to create favourable mechanical stresses in the healing region. Previously, the authors have developed the techniques for stress and strain control by thermal strains. This theory becomes applicable for the control of eigenstresses by phase transition. The present research is aimed to determine the forces induced by a fixation bracket made from shape memory alloy during bone fracture healing. If such a material is deformed after or during cooling-down to the martensite state, then, after installation and subsequent contact heating back up to the austenite state, the stored deformation recovers and it produces eigenstress. It is shown that for determination of forces induced by the shape memory effect as well as for stress control, it is not necessary to solve the boundary value problem within the theory of elasticity with eigenstrain.

Keywords: Cleft of the hard palate, accumulation of growth strain, displacement activator, independent control of stress and strain, finite element method