

عنوان مقاله:

CEMENT -OMPLANT INTERFACE FRACTURE FAILURE BY CRACKINITIATION DUE TO INTERFACE CAVITY
STRESS CONCENTRATION

محل انتشار:

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خلاصه مقاله:

Nowadays total joint replacements are widely used in the world , so n average 800,000 joint surgeries are done yearly only in Europe and North America , However implant loosening is and remains as the major issue of all implant failure and in this case the cement-implant interface cavities are very effective due to resultant stress concentration . In this study the theory of this problem, continuum and mathematical equations for an inhomogeneous material by using Eshelby's equivalent inclusion methoe with a spherical void as a special type of inhomogenities is assessed and a new yeild criterion with respect to the void's volume fraction is derived and changes in material elasticity tnesor concerning Mori-Tanaka's theorem also determined, then by using finite element method and remeshing technique a macro scale cement -implant interface cavity is modeled and concerning the loss of strength due to void existence and the interface stress concentration, the crack initiation and propagation phenomenon is numerically investigated with respect to differnet orthopedic cement material properties. The results show that crack propagates at the ninterface at constant stress and strain by elastoplastic material and it propagates in cement bulk by considering elastic material properties for cement that both could cause implant loosening even in vrry small void's volume fractions in which there are no significant changes in cement yield stress and elasticity tensor according to analytical solution. But munerical simulation showd that when a homo genous cement structure is achieved via high vacuum mixing method. there is a uniform stress distribution in the cement structure and no stress concentration zone forms .even at high stress levels and also there is no appropriate local site for crack initiation

کلمات کلیدی:

mechanical loosening , implant , porous material, fracture, crack propagation, finite element

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