A Non-linear Damage Model For The Annulus Of the Intervertebral Disc Under Cyclic Loading, Including Recovery

Authors : Shruti Motiwale, Xianlin Zhou, Reuben H. Kraft

Abstract : Military and sports personnel are often required to wear heavy helmets for extended periods of time. This leads to excessive cyclic loads on the neck and an increased chance of injury. Computational models offer one approach to understand and predict the time progression of disc degeneration under severe cyclic loading. In this paper, we have applied an analytic non-linear damage evolution model to estimate damage evolution in an intervertebral disc due to cyclic loads over decade-long time periods. We have also proposed a novel strategy for inclusion of recovery in the damage model. Our results show that damage only grows 20% in the initial 75% of the life, growing exponentially in the remaining 25% life. The analysis also shows that it is crucial to include recovery in a damage model.

Keywords : cervical spine, computational biomechanics, damage evolution, intervertebral disc, continuum damage mechanics
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