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Poroelastic dynamic structural models of rhesus spinal motion segments.

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Abstract
Finite element models (FEMs) and analytical and experimental models based on poroelastic constitutive laws were developed for rhesus spinal motion segments (SMSs). Long-time creep, transient creep, and impact were studied for SMSs with normal and simulated degenerated discs. The results suggested that long-time creep observed in excised SMSs may be reduced in the in vivo SMS. The fluid phase included in these FEMs was shown to play a significant role in the mechanical response of SMSs. Relative fluid motion fields predicted in the SMS could be related to nutritional paths to the avascular interior of the disc and were found to be very sensitive to changes in discal stiffness. Reduced disc height, increased discal bulge, altered fluid motion, and stresses were quantified and may be related to mechanical failure, disc degeneration, and low-back pain.

PMID: 4081864 [PubMed - indexed for MEDLINE]