



The natural history of age-related disc degeneration: the pathology and sequelae of tears

Spine 2007;32:2797-804

Vernon-Roberts B, Moore RJ, Fraser RD.

Adelaide Centre for Spinal Research, Institute of Medical and Veterinary Science,  
Adelaide SA, Australia. barrie.vernon-roberts@imvs.sa.gov.au

**STUDY DESIGN:** A quasi 3-dimensional pathologic survey of tears in the L4-L5 disc.  
**OBJECTIVE:** To seek accurate information on the pathogenesis and outcomes of tears to facilitate correlation with radiologic imaging and biomechanical testing; and to improve laboratory models for testing hypotheses of disc function and failure. **SUMMARY OF BACKGROUND DATA:** Tears are evidence of structural failure involving the annulus. There are substantial differences in the structure and function of the anterior and posterior annulus and the nonlamellar "nucleus" is much smaller than generally conceptualized and modeled. **METHOD:** Microscopy of sections prepared from 5-mm-thick parallel sagittal slices of 70 L4-L5 discs was used to construct maps of tears in each slice and record other features of interest. A template was used to classify data for analysis. **RESULTS:** Multiple-level analysis detected 20% more tears than in a single disc section. Concentric, perinuclear, and radiating tears often appeared first in the posterior disc and were numerous throughout life. However, rim lesions, transdiscal tears, endplate separations, and Schmorl's nodes were infrequent in young discs. Rim lesions and transdiscal tears markedly increased in the older discs while the other tears showed modest growth. In elderly discs, many tears acquired blood vessels accompanied by nerves capable of transmitting pain. Apart from about 15% of rim lesions, healing of tears by scar tissue was absent. Links between various types of tears result in complex discographic images from older discs and the cavitation of transdiscal tears lead to segmental instability.

**CONCLUSION:** Tears in the L4-L5 disc show different patterns of incidence with aging, which can be explained by current biomechanical concepts. Tears may not only perturb disc function and cause segmental instability, but the frequency of neovascularization accompanied by neoinnervation indicates that pain originating within the degenerate disc should not be dismissed as the frequent evidence of bleeding into the tear lumen indicates the susceptibility of the vessels to trauma.

PMID: 18246000 [PubMed - indexed for MEDLINE]