

Effect of annular defects on intradiscal pressures in the lumbar spine: An in vitro biomechanical study of discectomy and annular repair

J Neurol Surg A Cent Eur Neurosurg 2017; 78(01): 46-52

<http://dx.doi.org/10.1055/s-0035-1570344>

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Abstract

Background: Integrity of intervertebral disks may influence, and be influenced by, the maintenance of hydrostatic pressures inside the nucleus pulposus. Disk degeneration causes decreased pressures, leading to overload and injury of the annulus fibrosus, increasing the risk of disk herniation. Discectomies to treat disk herniation can cause further loss of hydrostatic pressures resulting in worsening degeneration. This study investigated the impact of opening the annulus on intradiscal pressure and whether implantation of an annular closure device (ACD) can restore physiologic pressures.

Methods: The pressure responses under unconstrained moments in concert with axial compressive loads of nine human cadaver lumbar disks were biomechanically tested at baseline, immediately following posterior annulotomy, and immediately following implantation of the ACD.

Results: The analysis of variance indicated a significant difference in the pressure response ($p = 0.0001$) among the three rounds of testing. Specifically, the post hoc Bonferroni test revealed that the pressure response after discectomy was significantly different when compared with baseline ($p < 0.001$) and after ACD implantation ($p = 0.001$). However, baseline and ACD pressure responses were insignificantly different ($p = 1.000$).

Conclusion: Our findings suggest that restoration of annular integrity during discectomy with implantation of the tested ACD may restore pressures closer to preoperative levels. Whether or not restoring pressures to preoperative levels has any clinical benefit or effect on the rate of degeneration is an area for further clinical research.

Financial disclosure:

One or more authors have received financial compensation from Intrinsic Therapeutics.
Full financial disclosures can be found in the manuscript.

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