Toxicity of Bupivacaine on Nucleus Pulposus Cells

Methods:
Nucleus pulposus (NP) cells were isolated from human surgical nucleus pulposus specimens as well as normal rabbit nucleus pulposus and knee articular cartilage. Cells were cultured in monolayer or alginate beads in 1:1 DMEM/F12, with 10% FBS, 1% P/S at 37°C, 5% CO₂ for 7 days. Cells were then exposed to 0.25 or 0.5% bupivacaine or 0.9% saline (control) for various times. Cells were released from monolayer by trypsinization or from alginate beads by sodium citrate treatment and assayed for cell death using a trypan blue exclusion assay. Results are presented as the average of 3-5 independent trials +/- standard deviation.

Results:
Exposure of human NP cells grown on monolayer to 0.5% bupivacaine revealed time-dependent alterations in cell morphology, loss of cell-cell contact, and increased cell detachment which is indicative of dead or dying cells. A dose and time dependence was observed for cell death as measured by trypan blue (Fig. 1).

Discussion:
These results indicate time and dose dependent cytotoxic effects of bupivacaine on human and rabbit NP cells in vitro. The differences in total cell death between human and rabbit samples may be the result of species differences, differences in culture conditions, or different sensitivities of normal vs. degenerative cells. Future studies will be needed to examine the mechanism involved in the increased cell death in response to bupivacaine exposure, as well as the clinical relevance to in vivo concentrations seen by the intervertebral disc.

References:

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