INTRODUCTION

- Low back pain (LBP) is the leading cause of disability in the United States with annual healthcare costs exceeding $100 billion.1, 2
- Discogenic pain originating from intervertebral discs (IVDs) is a major contributor to LBP
- Previous animal models of IVD degeneration (IDD) use disc-puncture via open anterior or posterior approach, resulting in significant morbidity.3, 4

OBJECTIVES

To develop a purely percutaneous disc-puncture model of lumbar IDD in rats while minimizing morbidity and the confounding effects of surgical site pain and inflammation inherent to traditional open approaches.

METHODS

- 10 rats underwent percutaneous lumbar annulotomy with a 23-gauge needle at L2-L3, L3-L4, and L4-L5. C-arm fluoroscopy confirmed disc puncture (Figure 1). 10 rats remained unpunctured as controls.

RESULTS

- Two-sample t tests conducted to determine statistical significance between groups. Statistical significance defined as p<0.05.

- Stabbed IVDs demonstrated decreased MRI signal intensity, from baseline through 18 weeks. Average L2-3, L3-4, and L4-5 disc intensities were decreased 65%, 65%, and 54%, respectively when compared to controls at 18 weeks (P < 0.001 at each level). This represents a 65%, 63%, and 56% decrease from baseline intensities (P < 0.001 at each level). (Figures 2 and 3)

- Disc volumes followed a similar pattern with the average L2-3, L3-4, and L4-5 disc volumes in the stabbed group decreased 78%, 76%, and 74%, respectively when compared to controls at 18 weeks (P < 0.001 at each level). This represents a 76%, 72%, and 68% decrease from baseline volumes (P < 0.001 at each level).

- Unstabbed discs in the stabbed rats did not demonstrate similar decreases in disc signal intensity or disc volume. Changes were first noted at 6 weeks and remained throughout all 18 weeks.

- Compared to control rats at 18 weeks, stabbed rats spent significantly less time in a supported rearing position. All other behaviors were similar between stab and control groups at 18 weeks.

DISCUSSION

- Significant differences in MRI signal intensities indicate that punctured discs undergo IDD following percutaneous annulotomy. Changes are noted at 6-week time point and remain consistent thereafter.

- Behavioral changes are noted in punctured animals between the 18-week and baseline time points. The behavioral parameters mentioned above were not found to be significantly different in the control animals between 18-weeks and baseline, nor were they significantly different between the puncture group and the control group at 18-weeks.

SIGNIFICANCE

This is the first study to successfully induce lumbar IDD after percutaneous needle annulotomy in a rat model, with pain-related behavior changes also noted in punctured animals consistent with IDD.

REFERENCES

2) Katz, JBJS (Am), 2006.

ACKNOWLEDGEMENTS

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