INTRODUCTION:
Low back pain, most commonly caused by intervertebral disc degeneration, is the leading cause of disability in patients under 45 years of age. Trends in patient dissatisfaction with surgical outcomes have been increasing over the past few years. Interestingly, a CDC report from 2009 reported that patients are spending billions of dollars on glucosamine supplements for their low back pain. Disc degeneration is characterized by loss of water and matrix macromolecules. Evidence exists that glucosamine may increase glycosaminoglycan (GAG) content in chondrocyte matrix. Nonetheless, a large gap between patient and physician enthusiasm regarding glucosamine for treatment of back pain exists. We therefore attempt to explore the effects of glucosamine on disc matrix homeostasis in an animal model of disc degeneration.

METHODS:
Eighteen skeletally mature New Zealand White rabbits were divided into four groups: control, stab, glucosamine, and stab+glucosamine. Stab surgery involved puncturing the annulus fibrosus (AF) of 3 lumbar discs with a 16 gauge needle to induce degeneration. This method has been previously described and validated in the literature. MRIs were obtained at 0, 4, 8, 12, and 20 weeks post stab for quantification of the MRI index. The MRI index (signal intensity of the nucleus pulposus (NP) divided by the NP area) is a measure of overall disc health. Discs were harvested at the 20 week time point for determination of GAG content in the AF and the NP using the 1,9 dimethylmethylene blue assay. Histological analyses with safranin-O and hematoxylin and eosin staining were also performed.

RESULTS:
Healthy rabbit discs treated with glucosamine had significantly lower GAG content in the NP and AF (Figs 1, 2) compared to control discs. There was no significant difference in disc GAG content in degenerated discs with glucosamine supplementation. The MRI index (Fig 3) of treated degenerated discs was significantly lower than that of untreated discs. There was no significant difference in the MRI index of treated and untreated healthy discs. Histological examination of discs treated with glucosamine showed lower cellularity and fibrosis in healthy and degenerated discs (Fig 4). In addition, the demarcation between the NP and the surrounding AF was completely obscured in degenerated discs treated with glucosamine.

DISCUSSION:
In this study, glucosamine appears to decrease total disc GAG content, reflected by a significant decrease in the MRI index as well as worsening fibrosis on histological analysis. This data suggests that glucosamine may be harmful to disc matrix.

SIGNIFICANCE:
This data raises concern over the use of glucosamine in patients with low back pain caused by disc degeneration.

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