**INTRODUCTION:** Lumbar discectomy is one of the most common surgical procedures with approximately 200,000 such procedures performed in the United States annually [1]. Although the herniated disc fragment is typically removed at the time of discectomy, the remainder of the intervertebral disc (IVD) continues to degenerate. Currently, there are no treatments at the time of discectomy that can suspend or reverse the degeneration of the remaining IVD. As is the case with all causes of degenerative lumbar disc disease, post-discectomy degeneration can result in severe pain requiring further interventions including injections and even surgery. The purpose of this study was to determine if the injection of growth factors into the disc space at the time of discectomy can help reduce degeneration of the remaining disc.

**METHODS:** Bovine caudal IVDs (6-8 month) were obtained from a local abattoir. Four IVDs were prepared from each cow (vertebrae cut just proximal and distal to EPs with a histological saw and cleaned with debridement tool), and randomly distributed among 4 groups: d0-control (fresh), cultured control (control), discectomy (injured), and discectomy + TGF-β (treated) (Fig. 1b). For injured and treated IVDs, a discectomy was created on the dorsal side with a cruciate cut using a #15 blade (to the center of the disc). IVD tissue was loosened and removed using a discectomy curette and a standard rongeur (Fig. 1). Depending on the IVD size (dia: = 23.36 ± 2.59 mm, vol: = 5.15 ± 2 cm³), an avg. of 18.8±1.8 mg/disc were removed. For the treated group, 0.2 mg TGF-β3 in 20 μl PBS+BSA was injected into the injury site following discectomy (Fig. 1). The discs were loaded in bioreactors and cultured for 7 or 19 days under diurnal loading (8h/16h = 0.1MPa/0.2 MPa) in standard high glucose DMEM, with media changes every 3–4 days.

**RESULTS:** In fresh discs cell viability was 98.8 ± 0.0% in annulus fibrosus (AF) and 98.6±1.8% in nucleus pulposus (NP). After 19 day culture, cell viability was maintained in control and treated IVDs (control: AF = 95.2±5.4% NP = 96.5±3.2%; treated: AF = 92.3±4.3% NP = 96.2±2.9%).

**DISCUSSION:** In this study we show that injecting TGF-β3 into the disc space after discectomy results in greater cell viability compared to untreated specimens. Previous studies have shown that even needle puncture has the potential to induce degenerative changes in large animal IVD organ culture models [3], and in this study we performed a discectomy procedure with NP tissue removal to create an injury model that more closely simulates what occurs clinically. Specimens that were injected with TGF-β3 at the time of discectomy maintained cell viability comparable to controls (>90% cell viability in the AF and NP), while specimens that underwent discectomy alone showed localized decrease in cell viability (<62% in AF and NP). Furthermore, TGF-β3 treated IVDs released NO at similar levels to controls whereas untreated discs showed increased NO release. Overall, results show that injecting TGF-β3 into the disc space after discectomy resulted in greater cell viability, reduced cellular stress, and less IVD height loss compared to untreated discectomy. While this model involves injury and treatment of healthy and young bovine IVDs that do not represent the human condition, these results are consistent with the hypothesis that injections into the disc space at the time of discectomy may help reduce degenerative changes in the injured IVD, and that growth factors such as TGF-β3, offer some promise for treatments. Further evaluation of effects on matrix synthesis and inflammation at the gene expression and protein level are ongoing.

**SIGNIFICANCE:** This study presents a novel model for addressing the relationship between operative interventions of discectomy after acute herniation and the degenerative effects after injury. Further investigation of the effect of NIH approved growth factors needs to be done.

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