Collagen Patch to Repair Intervertebral Disc Herniation and Degeneration (2015-050)

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Technology description

This collagen-based patch is a multi-laminate, ply-angle-ply sheet-based reinforcement used to biologically augment and facilitate repair of the annulus fibrosus (AF) of the intervertebral disc (IVD). Back pain is commonly associated with IVD pathologies including herniation and/or degeneration, resulting in structural defects within the AF. Nearly 500,000 lumbar discectomies are performed annually in the U.S. to aid in alleviating patient pain. During this procedure, a defect is created within the AF to remove herniated/degenerated nucleus pulposus (NP) tissue fragments. The resultant defect provides a path of least resistance for a reherniation to occur; resulting in costly reherniation operations (~$35k/re-operation) and eventually necessitates invasive spinal fusion surgery (~$115k/ procedure). To date, no ideal biomaterial exists for AF repair. Clemson University researchers have developed a collagen-based, multi-laminate, cell friendly patch for AF repair using a simple and scalable process, resulting in a biomaterial that demonstrates biochemical and mechanical properties comparable to that of the native human AF tissue.

Technical Summary

This biomaterial patch is used to effectively repair the AF of the intervertebral discs in the spine. It is composed of fully decellularized pig pericardium and is assembled in a manner which yields a multi-laminate patch that has a ply-angle-ply architecture mimicking native human NP. Mechanical testing data suggest the AF patch behaves similar to the native human AF in both static and dynamic tensile loading conditions, providing instant mechanical strength following surgical implantation. Additionally, mechanical burst testing demonstrates the patch’ s ability to withstand intradiscal pressures commonly observed. Cytocompatibility studies demonstrated the ability of the AF patch to support cell attachment and infiltration providing tissue regeneration capabilities.

Application Type:Provisional

Advantages

• Mimics biological composition and mechanical strength of native AF tissue, allowing for tissueregeneration

• Reduces risk for re-herniation and implant migration, reducing costs associated with revision

surgeries and need for spinal fusion procedures
• Produced via a simple, repeatable, and scalable batch process

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