Project Title: Biomechanical Determination of Target Properties for an Annulus Repair Implant

Project Acronym: ANNUMECH

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Abstract

The direct repair of lesions of the annulus fibrosus (AF) is limited to recent experimental studies of the use of suturing methods, membrane barriers, or an injectable sealant to repair damaged tissue. Experience with these methods is often limited to pilot studies and computer simulations, in the case of direct sealing or suturing (1-3). Recently, modified suture anchors and barrier membranes have been introduced for clinical use - Xclose, INclose and Barricaid - (4-6) however there is a paucity of objective data on their effectiveness and the use of an additional sealant appears unavoidable for maintaining integrity of the mechanical repair (7). Work to date has highlighted the difficulty of choosing appropriate implant components to provide not only a compliant yet strong repair to ensure that the tear does not rupture again, but also to ensure no detrimental influence on surrounding tissue due to a mismatch in the mechanical properties of the implant with the annulus tissue. Biocompatibility also remains an open question. Most recently, a biological membrane constructed of porcine small intestinal submucosa has been shown to provide some degree of support and healing to annular lesions (8). However, for clinical application the complicated approach and fixation of such a device must be addressed. ANNUMECH is a collaborative project aimed at establishing the functional requirements for next-generation annulus repair methods, proof-testing and screening candidate materials for implant development and performance testing of the intrinsic mechanical properties of the final implant designs and proof testing their biomechanical response in situ in cadaveric spine specimens. Through an iterative process of target definition through advanced simulation methods, prototype design and manufacture and prototype testing, we will work with the polymer experts of the ARI Davos (e.g. JANUSCAF) to produce a viable solution for the treatment of annular lesions.