Formulation of a Bovine Gelatin Crosslinked Scaffold for Potential Human Tissue Applications: Cost-Effective, Patient Specific Alternative Treatment of Acetabular Labral Tears of the Hip

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Acetabular labral tears comprise 22% of reported groin pain. Repairs involve suturing torn tissue to the bone via anchors, or removing inflamed tissue. Both prevent the body from healing naturally. The Bridge-Enhanced ACL Repair piloted by Boston Children's Hospital, a collagen-based scaffold, reduces pain, recovery time, and osteoarthritis by letting ACL heal naturally. This research seeks to design a gelatin-based scaffold for the hip labrum composed of hyaluronic acid, a Glycosaminoglycan, cross-linked with glutaraldehyde and glyceraldehyde producing similar results. A 2% gelatin was chosen and mixed with .5% (w/v) hyaluronic acid. Six gels were cross-linked with glutaraldehyde and D-L glyceraldehyde at concentrations of .1%, 1%, and 10% (w/v). Young's Modulus for each scaffold was recorded via ball bearing apparatus, ImageJ, and equation (Ju & Liu 2001). With a general Young's Modulus (E) of various tissue and acetabular labrums between 42-44 MPa, candidate gel was 2% bovine gelatin/hyaluronic acid blend cross-linked with 10% glutaraldehyde solution, having the closest properties to the given E of an actual acetabular labrum, 41.21 MPa. As cells prefer firm growing conditions, an interface was produced by making a gel with a thin 10% gelatin outer layer for bone adherence, and another layer with the candidate 2% gel. The layers were cross-linked with the 10% glutaraldehyde solution. CT scan data of the human hip joint was 3D printed. The scaffold described was set in acetabulum making scaffold patient-specific. Molded device was frozen/lyophilized to determine preservability. Gelatin-based scaffold, rather than collagen, is less expensive, making device cost-effective at $22 per unit.

Awards Won:
Third Award of $1,000