

Biomechanical and Cellular Evaluation of Autologous Fibrin Glue (CryoSeal) for Tissue Adhesion and Mesenchymal Stem Cell Proliferation

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Background: Cell-based therapies such as chondrocyte and mesenchymal stem cell (MSC) transplantation require scaffolds with biodegradability, mechanical strength, and cell-supportive capacity. Fibrin glue, a biological adhesive derived from fibrinogen and thrombin, has excellent biocompatibility and is widely used clinically, but the biomechanical and proliferative effects of autologous fibrin glue remain unclear.

Purpose: To evaluate the biomechanical reinforcement and proliferative capacity of autologous fibrin glue (CryoSeal).

Methods: Two mechanical tests were performed using porcine femoral condyles: tensile strength (suture-only vs. suture+fibrin glue; n=10 each) and push-in test with collagen gel and membrane (with or without fibrin glue; n=10 each). For the proliferation assay, MSCs derived from polydactyly tissue were embedded in gels prepared with autologous fibrin glue or commercial fibrin glue (Bolheal), and dsDNA content was measured after 7 days.

Results: Maximum failure load was significantly higher in the suture+fibrin glue group vs. suture-only (11.29 ± 3.10 vs. 6.61 ± 1.21 N, $p < 0.05$), and push-in strength was higher with fibrin glue vs. controls (6.05 ± 1.55 vs. 0.90 ± 0.41 N, $p < 0.05$). MSC proliferation was greater in the autologous fibrin group than in the commercial fibrin group (0.94 ± 0.77 vs. 0.085 ± 0.058 $\mu\text{g/ml}$, $p < 0.05$).

Conclusion: Autologous fibrin glue significantly reinforced tissue adhesion and promoted MSC proliferation, suggesting potential as a bioactive scaffold in cartilage regenerative therapy.

