

Concept of study

Labral tears exhibit limited intrinsic healing and persistent inflammation, leading to tissue erosion after surgical repair (**Figure 1A**). Cromolyn preserves labrum morphology but fails to close the tear gap (**Figure 1B**). (Platelet-Derived Growth Factor) PDGF reduces the tear gap but causes tissue erosion and loss of native curvature (**Figure 1C**).

→ **The combination approach**

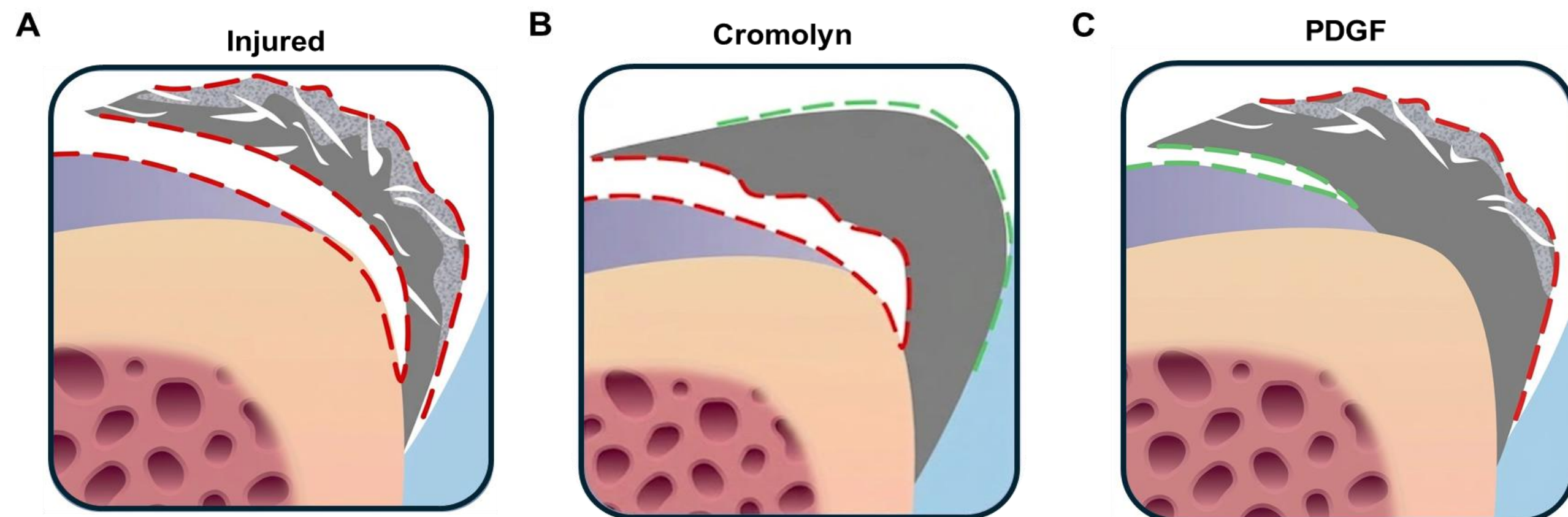


Figure 1. Schematic illustration of labrum curvature and tear gap outcomes across treatment conditions.

Methods

Treatment Groups:

1. Injured
2. Platelet Derived Growth Factor (PDGF) Adhesive
3. Cromolyn
4. The combination of PDGF and Cromolyn (PDGF + Cromolyn)

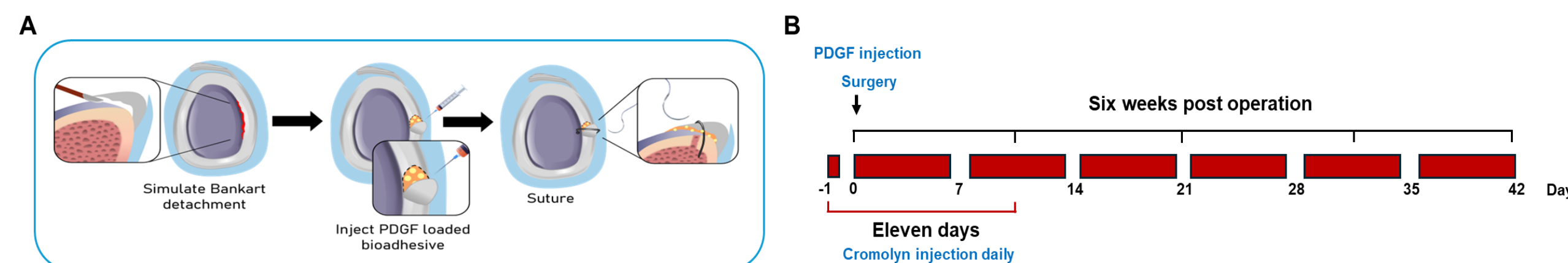


Figure 2. Experimental design and surgical procedure for the Bankart lesion repair model. **(A)** Schematic illustration of the surgical procedure: (1) simulation of Bankart detachment, (2) injection of PDGF-loaded bioadhesive at the repair site, and (3) suture fixation. **(B)** Timeline of the *in vivo* study

Results

The combination of Cromolyn and PDGF produces **the best tissue reattachment** and **structural restoration** by reducing the tear gap and restored labrum curvature while attenuating MMP-13 expression compared to all other groups

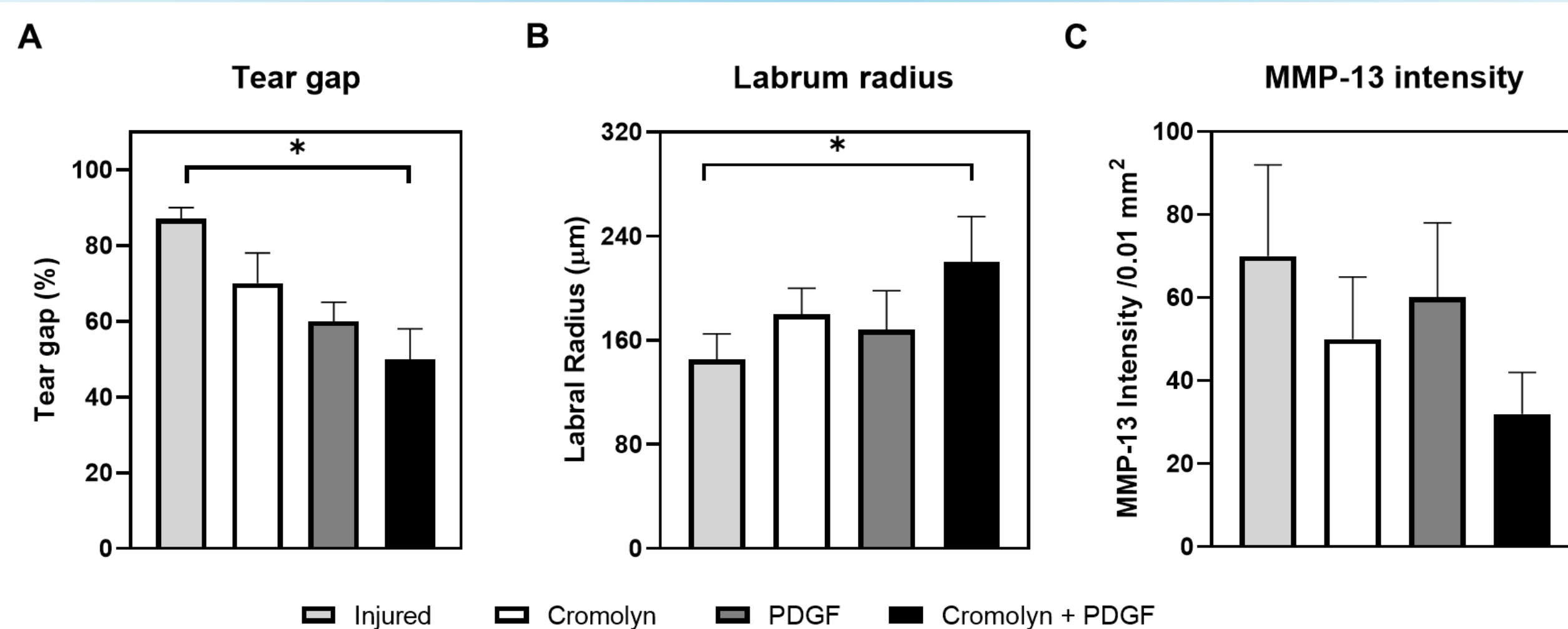


Figure 3. Quantitative assessment of labrum repair quality across treatment groups.

Combined treatment promotes superior Collagen I (Col-I) maturation (3.3x higher) and Glycosaminoglycans (GAG) deposition (2.3x higher) compared to individual treatments thereby **improving extracellular matrix composition**

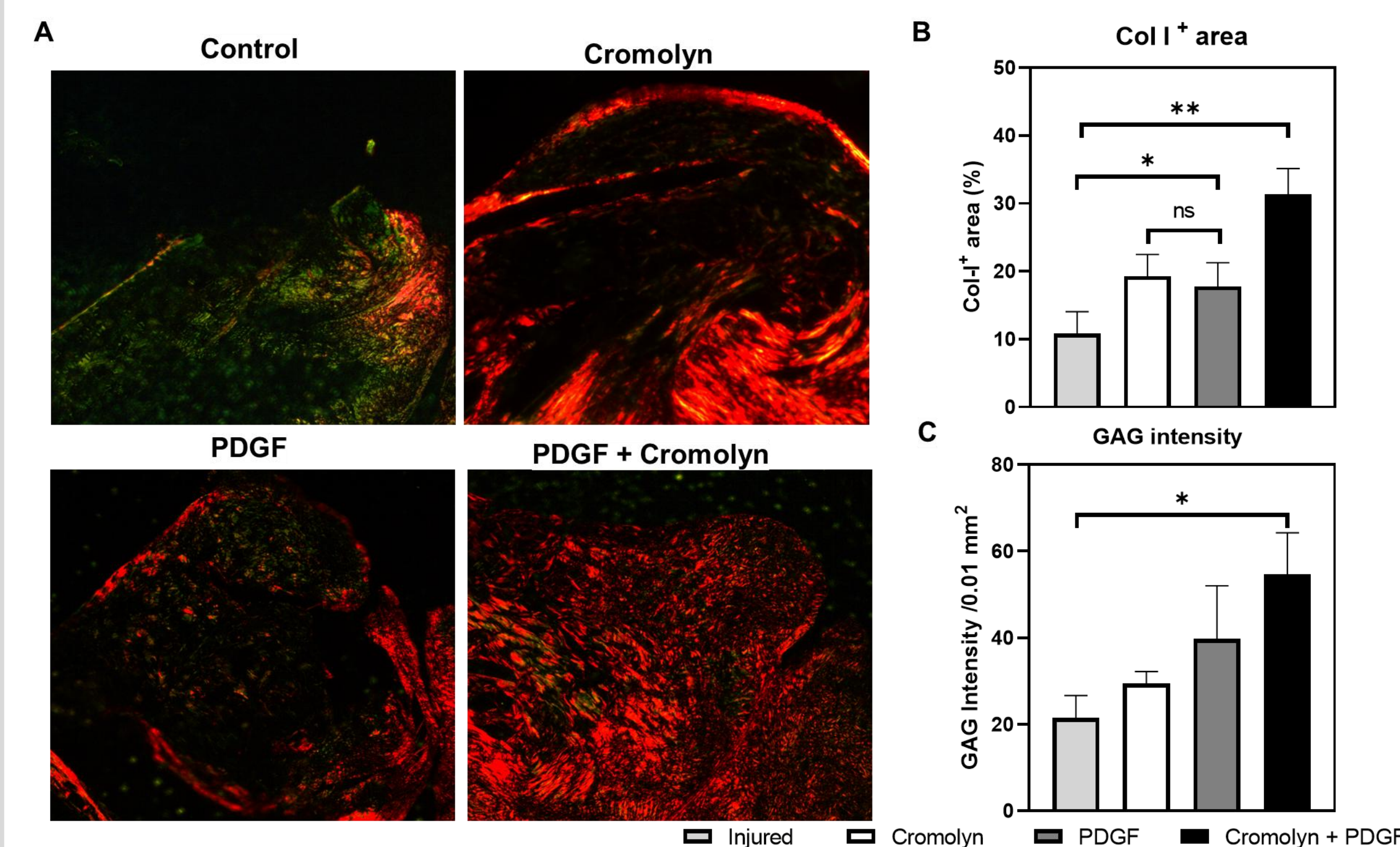


Figure 4. Extracellular matrix composition of the labrum across treatment groups.

Cromolyn and PDGF co-treatment modulates **the inflammatory microenvironment** toward **a pro-regenerative state** by suppressed MCs activation, reduced CD11b⁺ cell infiltration (~84%), shifting macrophage polarization to M2 phenotype

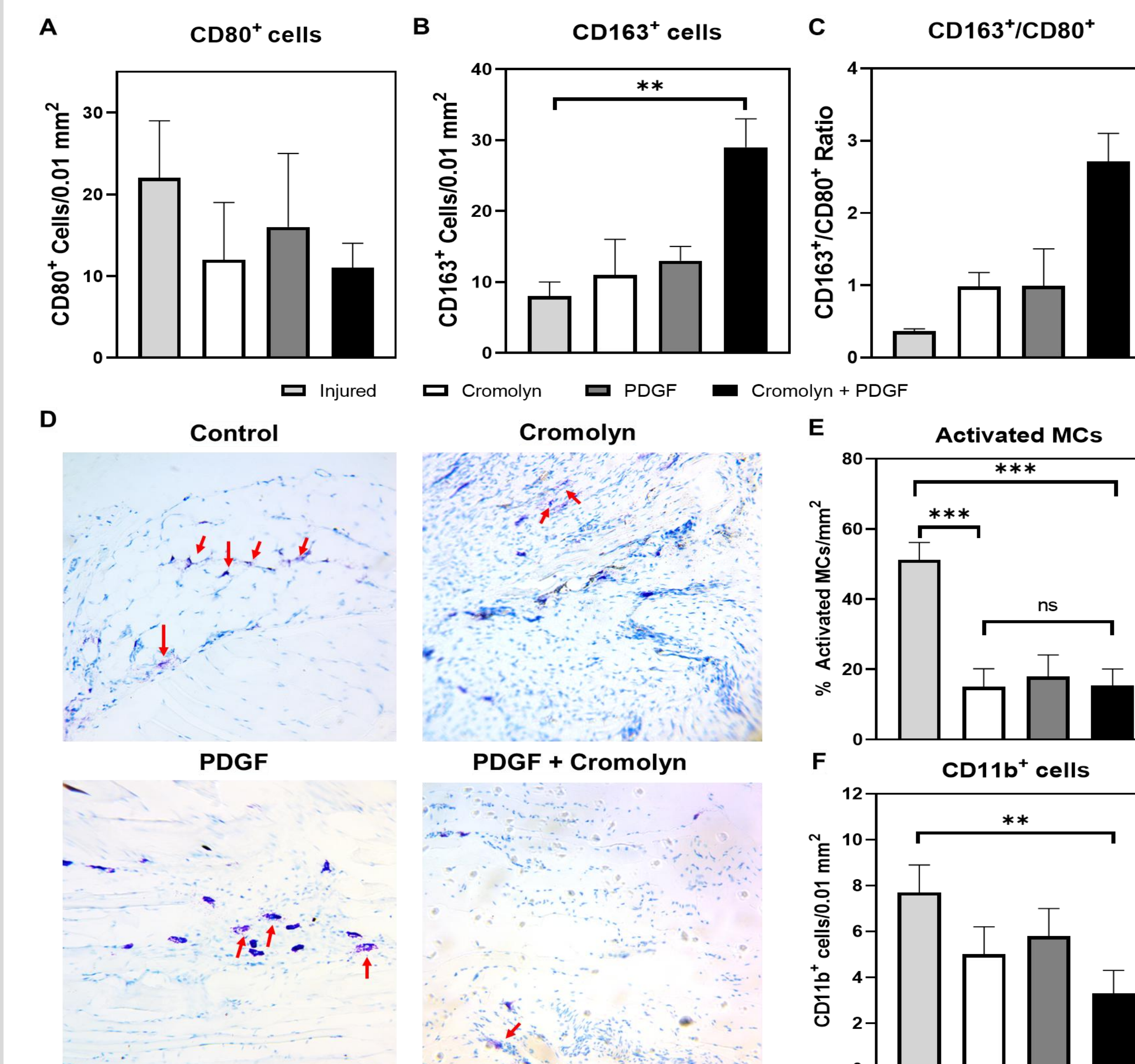


Figure 5. Inflammatory cell profiling and mast cell activity in labrum in various treatment groups.

Combined therapy achieves near-healthy functional recovery (~ 81% of healthy function) in the Bankart repair model

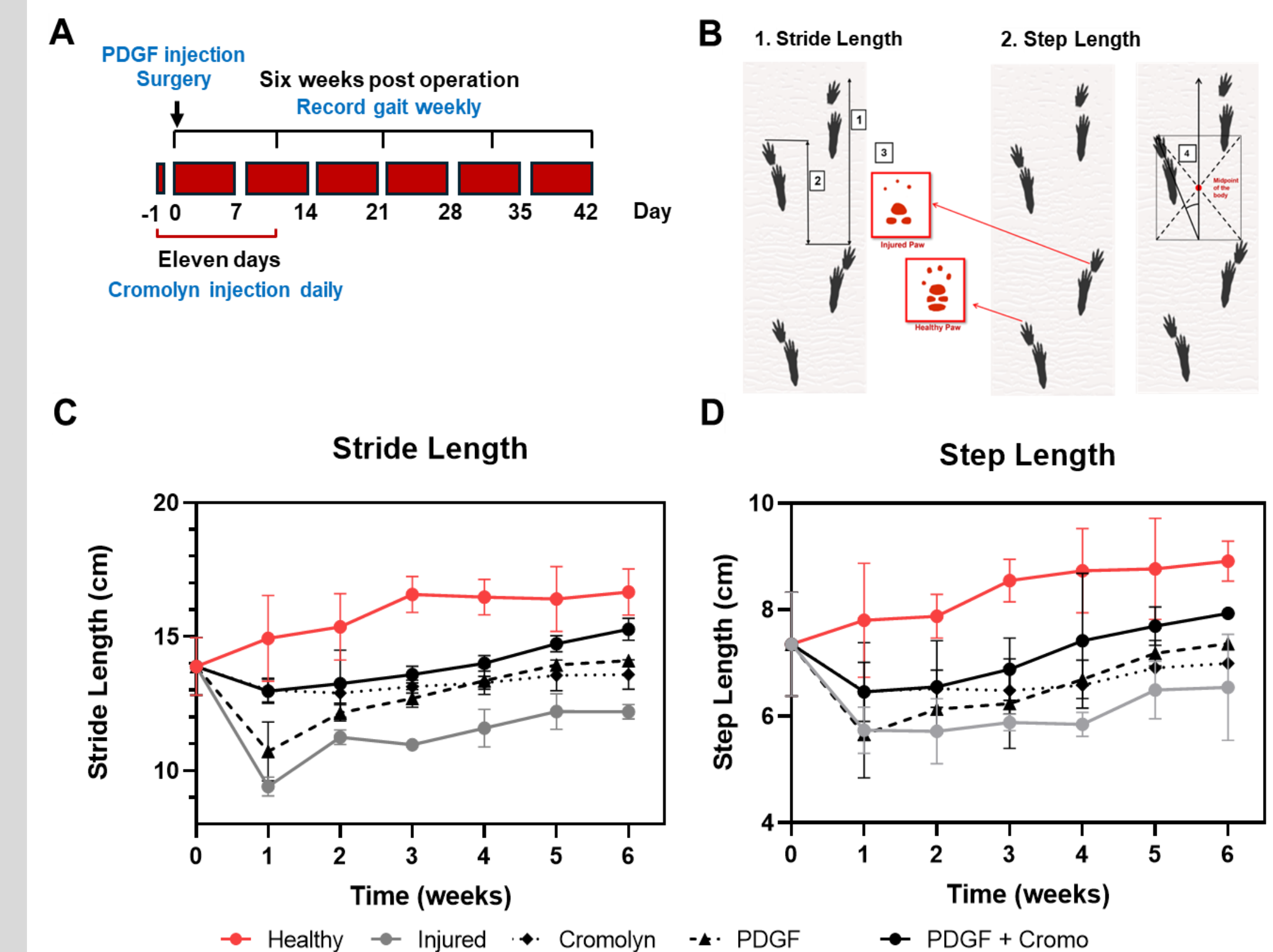


Figure 6. Gait parameter analysis for functional outcome assessment in rats.

Conclusions

The combination treatment of PDGF and Cromolyn significantly:

- Produces Best Tissue Restoration
- Reduces the inflammatory markers
- Increases the markers of tissue regeneration
- Improves functional recovery

➔ **Balancing immunomodulation with growth factor delivery represents a promising strategy for enhancing labrum repair**

Future works

- Investigate the recruitment of endogenous stem cells
- Evaluate the chondrogenic differentiation potential of recruited stem cells
- Expand the study to assess sex-based differences in inflammatory response, tissue remodeling, and functional recovery outcomes

References

1. Co CM, Vaish B, Hoang LQ, et al. Mast Cells Mediate Acute Inflammatory Responses After Glenoid Labral Tears and Can Be Inhibited With Cromolyn in a Rat Model. *The Am. J. Sports Med.* 2024;52(13):3357-3369.
2. Co CM, Nguyen T, Vaish B, et al. Biomolecule-releasing bioadhesive for glenoid labrum repair through induced host progenitor cell responses. *J Orthop Res.* 2023;41:1624-1636.

