Clinical Summary

Augmented Ulnar Collateral Ligament Repair With Structural Bioinductive Scaffold: A Biomechanical Study

Authors: Kenneth M. Lin, MD, Kenneth Brinson, BS, Ran Atzmon, MD, Calvin K. Chan, MS, Seth L. Sherman, MD, Marc R. Safran, MD, Michael T. Freehill, MD
Journal: The American Journal of Sports Medicine

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Aim:

To evaluate the biomechanical feasibility of augmenting primary ulnar collateral ligament (UCL) repair with a bioinductive, absorbable structural scaffold and compare its time-zero strength to repair alone.

Methods

- **Design:** Controlled laboratory study using cadaveric elbows
- **Specimens:** 8 fresh-frozen cadaveric elbows from midforearm to midhumerus (mean age 52 ± 7 years)
- Testing States:
  - Native intact UCL
  - UCL-transected
  - Repair alone
  - Repair augmented with bioinductive scaffold
- Biomechanical Testing:
  - Valgus stress applied at 30°, 60°, and 90° of elbow flexion
  - Valgus gapping measured using a robotic 6 DOF testing system
- **Statistical Analysis:** Wilcoxon signed-rank test with Holm-Bonferroni correction

Patient Characteristics

- **Mean Age:** 29 years
- Valgus Gapping:
  - Transected UCL: Greatest gapping at all angles
  - Repair Alone: Similar gapping to transected state at 30° and 60°, slightly improved at 90°
  - Augmented Repair: Significantly reduced gapping vs. repair alone at all angles
    - 30°: 1.35° vs 2.08° (P = .021)
    - 60°: 1.50° vs 2.24° (P = .024)
    - 90°: 1.57° vs 1.97° (P = .024)
  - Compared to native state, augmented repair showed slightly increased gapping at 30° and 90°, but not at 60°

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Discussion

- Augmented repair with bioinductive scaffold provided additional time-zero strength without overconstraint.
- Scaffold may offer more physiologic mechanical properties and better biocompatibility than suture tape.
- Potential for reduced stress shielding and improved long-term healing due to absorbable nature.
- Testing at multiple flexion angles (30°, 60°, 90°) is clinically relevant for throwing athletes.
- No significant differences based on testing order or secondary joint motions.

Limitations

- Cadaveric model limits clinical generalizability.
- Time-zero analysis only; no long-term healing assessment.
- No direct comparison to suture tape augmentation.
- Potential for plastic deformation during repeated testing.
- Scaffold fixation technique not yet standardized.

Key Takeaways

- Bioinductive scaffold augmentation in UCL repair is biomechanically feasible and enhances initial joint stability.
- May allow for earlier rehabilitation while avoiding risks associated with nonabsorbable materials.
- Further clinical and comparative studies are needed to assess long-term outcomes and validate superiority over existing techniques.

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