visualizing the dorsolateral ulnoulnar joint space. Intraoperatively

Data:
Introduction: The correct implantation of radial head arthroplasty to avoid over-lengthening is essential for the prognosis of the elbow joint. Frank et al. showed that an overlengthening above 2 mm is visible due to widening of the anterolateral ulnoulnar joint space in cadaver specimens. This joint space is difficult to visualize. Whereas the commonly used Kocher approach allows visualization of the dorsolateral joint space without additional instruments or further surgical release of the already unstable elbow. Taking this into consideration the aim of our study was to investigate whether the easier visualization of the dorsolateral joint space is also a reliable method to indicate overlengthening in radial head arthroplasty. Material and Methods: Radial head arthroplasty was performed in 5 human cadaver specimens with the forearm, wrist, and hand intact. The lateral ligament complex was detached and an isometric transosseous repositioning was performed. 6 stages of implantation heights were documented for the radial head arthroplasty: native joint with LCL repair (1), perfect height (2), +2 mm (3), +4 mm (4), +6 mm (5) and -2 mm (6). Clinical measurement and image analysis of the dorsolateral and anterolateral ulnoulnar joint space was performed. Results: The dorsal and anterior ulnoulnar joint space width was negligible in the native joint with LCL repair (1) and the radial head arthroplasty implanted at correct height (2) as well as implantation with -2 mm (6). There was a significant increase in joint space width at all stages of overlengthening (+2, +4 and +6 mm) compared to stage 1, 2 and 6. Overlengthening of +2 mm showed a mean gap of 1.9 ± 0.97 mm dorsal (p=0.0081) and 1.59 ± 0.61 mm anterior (p=0.0482). The mean gap size dorsal in +4 mm was 3.52 ± 1.51 mm and 5.20 ± 1.63 mm at +6 mm implantation height. Anterior an overlengthening of +4 mm showed a mean ulnoulnar joint space width of 3.06 ± 0.43 mm and 5.07 ± 0.40 mm at +6 mm implantation height. The intraclass correlation coefficient was 0.997 and the 95% confidence interval was 0.9673 to 0.9996 between the dorsal and anterior ulnoulnar joint space. Conclusion: Visualization of the dorsolateral aspect of the ulnoulnar joint space is a reliable indicator for overlengthening in radial head arthroplasty without further compromising an already unstable elbow. The method from Frank et al. regarding the anterolateral joint space could further be adapted to a alternative radial head arthroplasty system than described in the original paper. Merging the findings of the anterolateral ulnoulnar joint space in different implants leads to the assumption that visualization either of the ulnoulnar joint space dorsally or anteriorly is universally applicable to determine overlengthening in radial head arthroplasty, regardless of the type of the radial head implant.

Category: Elbow/Wrist/Hand

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

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Summary:
Augmentation with a bioinductive, bioabsorbable structural scaffold imparts additional time zero biomechanical strength to ulnar collateral ligament repair alone, and restores valgus stability without over constraint.

Data:
Background: Ulnar collateral ligament (UCL) repair with suture brace augmentation has been shown to have good time-zero biomechanical strength and short-term outcomes with more rapid return to play than traditional reconstruction techniques. However, there are concerns of intraarticular biocompatibility, and over-constraint or stress shielding with the use of nonabsorbable suture tape. Recently, an off-the-shelf bioinductive structural scaffold, that absorbs at 2 years and has more physiologic mechanical properties, has been FDA approved for augmentation of soft tissue repair. The purpose of this study is to assess the feasibility of the biomechanical performance of UCL repair augmented with this structural scaffold. Materials and Methods: Seven cadaveric elbow specimens, from mid-forearm to mid-humerus were utilized. Sample size of 4 was determined, through power analysis using expected effect size from the literature, to yield a power of 0.8. The forearm was potted in neutral rotation. The surgical approach was performed, down to the level of the intact capsule and UCL (Figure 1A). The elbow then underwent valgus stress testing at 30, 60, and 90 degrees flexion, with a cyclical valgus rotational torque of 2-5 Nm, as described in prior studies of UCL repair, to establish the native state. Testing was then performed in 3 additional states (Figure 1B-D): UCL-transected, augmented UCL repair with scaffold, and repair alone with scaffold not fixed. The order of testing in relation to repair with scaffold, and repair alone without scaffold, was alternated for specimens to account for any possible elastic deformation through testing. The repair technique was based on the previously described Internal Bracey augmented repair, but with scaffold instead of suture tape (Figure 2). Valgus opening, measured in degrees, was compared among the 4 states, as repeated measures for statistical analysis. Results: There was a significant difference between each of the 4 UCL repair states, at all flexion angles (P<0.001, and 0.0001 at 30, 60, and 90 degrees flexion, respectively by repeated measures ANOVA; Figure 3). Valgus opening was significantly improved with scaffold-augmented repair compared to repair alone (P=0.003 for all flexion angles). Valgus opening was similar between UCL-transected state and repair alone (P=0.4, 0.2, and 0.1 for 30, 60, and 90 degrees). The scaffold-augmented repair did not decrease valgus opening beyond that of the native state. Conclusion: Augmentation with a bioinductive, bioabsorbable structural scaffold imparts additional biomechanical strength to UCL repair alone, and restores valgus opening close to but not tighter than the native state. Use of this absorbable structural scaffold imparts time zero strength in the setting of ligament repair. Return to play timelines may still be longer than suture tape augmentation, but use of a bioabsorbable scaffold with more physiologic mechanical properties alleviates the risk for stress shielding, over-constraint, and biocompatibility concerns.

Category: Elbow/Wrist/Hand

Do Pyrocarbon Radial Head Replacements Offer Satisfactory Clinical and Radiological Outcomes? A Systematic Review

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Summary:
Theoretical pyrocarbon promises to be a superior material for radial head arthroplasty due to its high biocompatibility with the bone. The primary objective of this systematic review was to evaluate clinical and radiological outcomes of Pyrocarbon radial head replacements.

Data:
Background: Pyrocarbon promises to be a superior material for radial head arthroplasty due to an elastic modulus comparable to the native bone and thus providing higher biocompatibility. The primary objective of this systematic review was to synthesize available literature investigating the clinical and radiological outcomes of Pyrocarbon radial head replacements.

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