Twenty-nine players (mean age, 14 years; range, 11-16 years) underwent arthroscopic debridement: 5 were pitchers, 6 were catchers, 13 were infielders, and 5 were outfielders. Mean follow-up duration was 26 months (range, 24-66 months). Timmerman-Andrews score at the latest follow-up was 188 (range, 165-200) points. Mean defect size was 44.6% (range, 22.6%-68.21%). Mean superior angle was 91.82 (range, 69.80-110.90) degrees, mean inferior angle was 22.41 (range, 32.53-55.33) degrees, and mean defect angle was 69.41 (range, 47.40-135.04) degrees. Timmerman-Andrews score was positively correlated with the inferior angle (r = -0.494, p < 0.01) and negatively correlated with the defect angle (r = -0.431, p = 0.020). For each sub-score considered, pain and sagittal arc of motion were positively correlated with the inferior angle (r = 0.467, p = 0.011, r = 0.387, p = 0.038), and flexion contracture was negatively correlated with the defect angle (r = -0.398, p = 0.033). Conclusion: Posterior or large osteochondral defects of the humeral capitellum on preoperative reconstructed CT sagittal images were associated with poor outcomes of arthroscopic debridement for capitellar OCD in adolescent baseball players.

Category: Elbow/Wrist/Hand

Anconeus Sparing Minimally Invasive Approach For Lateral Ulnar-Collateral Ligament Reconstruction In Posterolateral Rotatory Elbow Instability Shows Excellent Clinical Results

Abstract ID# 21946

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Summary:
The anconeus sparing minimally invasive technique for posterolateral stabilization of the elbow using a triceps tendon autograft is an effective and safe treatment for chronic posterolateral instability of the elbow.

Data:
Introduction: Surgical treatment helps restore stability to the elbow in patients with posterolateral rotatory instability (PLRI). The anconeus muscle is one of the most important active stabilizers against PLRI. A minimally invasive anconeus sparing approach for lateral ulnar collateral ligament (LUCL) reconstruction using a triceps tendon autograft has been previously described. The purpose of this study was to evaluate the outcome of this intervention and identify risk factors that influenced the clinical and patient reported outcomes. The hypothesis is that the LUCL reconstruction will lead to a significant more stable elbow. Methods: 61 patients with chronic PLRI and no previous elbow surgery who underwent surgical reconstruction of the LUCL using a triceps tendon autograft in a minimally invasive anconeus sparing approach during 2012 and 2018 were assessed. Outcome measures included a clinical examination and the Oxford Elbow Score (OES), the Mayo Elbow Performance Score (MEPS), the Disability of the Arm and Shoulder and Hand (DASH) questionnaires and the Visual analogue scale (VAS) for pain. Patient satisfaction was assessed with the Subjective Elbow Value (SEV) and school grade. Clinical stability of the elbow was evaluated with the Push-up Test, the Pivot-shift test, Stand-up test and the pincer grip. Integrity of the common extensor tendons and centering of the radial head were assessed on standardized MRIs. Results: The average age of the patients was 52 years with a mean follow up of 53 months (range 27-86). Clinical examination after surgery showed no clinical signs of instability (P < 0.01) and a non-significant improvement in range of motion (P > 0.05). OES, MEPS, DASH and VAS averaged 40 out of 48 points (SD: 10), 92 out of 100 (SD:12), 9 out of 100 (SD: 14) and 1 (SD:2), respectively; all corresponding with good or excellent outcomes. Only one patient had to undergo revision surgery due to pain and there were no postoperative complications in this cohort. Superior functional results were observed in patients without radius subluxation on the MRI with a confirmed rupture of the LUCL. Conclusion: The anconeus sparing minimally invasive technique for posterolateral stabilization of the elbow using a triceps tendon autograft is an effective and safe treatment for chronic posterolateral instability of the elbow with substantial improvements in elbow function and pain relief.

Category: Elbow/Wrist/Hand

Relationship Between The Content Of Autologous Platelet-Rich Plasma And Clinical Efficacy Of Tennis Elbow Treatment Six Months After Injection

Abstract ID# 22009

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Summary:
Evaluation of the relationship between cellular content, growth factors, inflammatory cytokines in autologous platelet-rich plasma and clinical efficacy 6 months after its injection into the lateral epicondyle region of patients with Tennis Elbow.

Data:
Background Tennis Elbow (TE) is a commonly used term to describe tendinopathy of proximal attachment of extensor muscles to the lateral humeral epicondyle. In cases where severe pain limits daily functioning for a longer period, patients desperately seek for effective solutions. Many treatments have been developed, the effectiveness of which is highly controversial. One of such methods is the injection of autologous platelet-rich plasma (PRP). Its action is based on the local administration of high concentrations of platelet-derived growth factors, which are supposed to stimulate healing and regeneration of tissues. The aim of the study was to assess the relationship between the cellular composition and cytokine content in PRP and the clinical effectiveness of injection therapy in patients with TE. Material and Methods Thirty patients diagnosed with TE were recruited for the study and received one injection of 2 ml of leukocyte-rich PRP to the lateral epicondyle region. All PRP samples were analyzed for cellular content and the content of several inflammatory cytokines and selected growth factors including Transforming growth factor-ß1, Epidermal growth factor (EGF), Fibroblast growth factor-basic, Vascular endothelial growth factor, Hepatocyte growth factor, Platelet-derived growth factor. The clinical efficacy of the treatment, before the injection and after 6 months was assessed in terms of the mean daily pain intensity measured by Visual Analog Scale (VAS), pain intensity during provocation tests, the pressure pain threshold (PPT), Subjected Elbow Value (SEV), strength of the grip and the muscle groups during wrist extension and supination, and by the Disability of Arm, Shoulder and Hand (DASH) questionnaire. A statistical analysis of the correlations between biologically active components in PRP and the size of improvement in each parameter, was performed. Results After six months all measured outcomes significantly improved. Twenty-five (83%) patients reached a minimal clinically important difference in decrease in pain intensity, and 23 (76%) in functional improvement measured by DASH. At the final end point symptoms completely disappeared in 10 patients. One patient resigned from the study after 3 months, due to dissatisfaction with the results of the treatment. The positive low significant Pearson’s correlation was found between PLT concentration in PRP and the size of improvement measured by SEV (r = -0.40). Significant low positive Spearman’s correlation between EGF concentration and pain decrease (r = 0.42) was found. Significant low negative Spearman’s correlations between functional improvement measured by DASH and several inflammatory cytokines were found: Interferon-a2 (r = -0.39), Interferon-ß (r = -0.46), Monocyte Chemoattractant Protein-1 (r = -0.39), Interleukin-17A (r = 0.46), and Interleukin-33 (r = -0.43). Conclusion The study showed significant correlations between the content of biologically active components in PRP and the clinical outcomes of TE treatment after 6 months. The obtained results suggest the need for further research aimed at reducing the content of inflammatory cytokines and increasing the growth factors in PRP.

Category: Elbow/Wrist/Hand

Visualization of the Dorsolateral Ulnohumeral Joint Space Is Reliable to Indicate Overlengthening in Radial Head Arthroplasty

Abstract ID# 22631

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Summary:
Overlengthening in radial head arthroplasty can reliably be avoided by...
visualizing the dorsolateral ulnohumeral 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 ulnohumeral joint space 

\[ \text{space width at all stages of overlengthening (+ 2, + 4 and + 6 mm) compared to } \]

\[ \text{joint space width of 3,06 ± 0,43 mm and 5,07 ± 0,40 mm at + 6 mm implantation} \]

\[ \text{with LCL repair (1) and the radial head arthroplasty implanted at correct height (2)} \]

\[ \text{Anterior lateral ulnohumeral joint space width was negligible in the native joint} \]

\[ \text{native joint with LCL repair (1), perfect height (2), + 2mm (3), + 4mm (4), + 6mm (5) and -2mm (6). Clinical measurement and image analysis of the dorsolateral and anterolateral ulnohumeral joint space was performed. Results: The dorsal and anterior lateral ulnolateral 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 -2mm (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 + 4mm 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 implanta-}

\[ \text{tion height. Anterior an overlengthening of + 4 mm showed a mean ulnolateral joint space width of 3.06 ± 0.43 mm and 5.07 ± 0.40 mm at + 6 mm implantation height. The intraclasp correlation coefficient was 0.997 and the 95% confidence interval was 0.9673 to 0.9996 between the dorsal and anterior ulnolateral joint space. Conclusion: Visualization of the dorsolateral aspect of the ulnolateral joint space is a reliable indicator for overlengthening in radial head arthroplasty without further compromising an already unstable elbow. The method from Frank et al. regarding the anterolateral joint space could further be adapted to a alternative radial head arthroplasty system than described in the original paper. Merging the findings of the anterolateral ulnolateral joint space in different implants leads to the assumption that visualization either of the ulnolateral joint space dorsally or anteriorly is universally applicable to determine overlengthening in radial head arthroplasty, regardless of the type of the radial head implant.} \]

Category: Elbow/Wrist/Hand

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

Abstract ID# 22841

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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 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 Brace 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 = 0.01, <0.0001, 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 liga- ment repair. Return to play timelines may still be longer than suture tape augmentation, but use of a bioabsorbable scaffold with more physiologic me- chanical 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

Abstract ID# 23303

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Summary:
Theoretically 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 while the secondary objective was to determine the complications and revision rates related to the usage of these prostheses. Methods: Three electronic databases (PubMed, Medline, EMBASE) were used to search for studies published on outcomes and complications of the radial head arthroplasties using Pyrocarbon radial head prostheses. The systematic review was designed in accordance with the PRISMA guidelines and the review was registered prospectively in the PROSPERO data- base. The studies were appraised and scored using the Methodological Index for Non-Randomized Studies (MINORS) tool. To ensure repeatable results, the database searches were performed independently by two authors on two separate occasions. Functional outcomes were assessed objectively using different PROMs like MEPS, DASH and BMS (Broberg-Morrey Score). Range of motion was measured using goniometer and grip-strength was measured using the dyna- meter. Post-operative radiological outcomes were reported using radiographs. Results: A total of 13 studies cumulatively reporting 330 patients who underwent Pyrocarbon radial head arthroplasty were included in the review. The mean age of patients ranged from 47 years to 54 years of which 51.1% were males. The majority of radial head replacements were done for acute trauma (86.6%; 297/ S15 343) with the remainder done for arthritis (1.5%) and trauma sequelae (11.9%).