**Paper #8 ONE AND TWO-YEAR CLINICAL OUTCOMES FOR A STANDARD ALL-POLYETHYLENE GLENOID COMPONENT WITH A FLUTED CENTRAL PEG: ANALYSIS OF 1270 INDIVIDUAL PATIENTS FROM 11 DIFFERENT CENTERS**

*Frederick A. Matsen III, MD[a], Joseph P. Iannotti, MD, PhD[b], R. Sean Churchill, MD[c], Lieven De Wilde Sr., PhD, MD[d], T. Bradley Edwards, MD[e], Matthew C. Evans, FRACS, MBBS[f], Edward V. Fehringer, MD[g], Gordon I. Groh, MD[h], James D. Kelly II, MD[i], Christopher M. Kilian, MD[j], Giovanni Merolla, MD[k], Tom R. Norris, MD[l], Giuseppe Porcellini, MD[m], Edwin E. Spencer Jr, MD[n], Anne Vidil[o], Michael A. Wirth, MD[p], Stacy M. Russ, BA[q], Moni B. Neradilek[r], **Jeremy S. Somerson, MD**[s], [a] Department of Orthopaedics and Sports Medicine, University of Washington Medical Center, Seattle, WA, USA; [b] Department of Orthopaedic Surgery, Cleveland Clinic, Cleveland, OH USA; [c] Orthopaedic Surgery, Aurora Health Center, Milwaukee, WI 53209, USA; [d] Shoulder & Elbow Surgery, Department of Orthopaedic Surgery and Traumatology, Ghent University Hospital, Ghent, Belgium; [e] Fondren Orthopaedic Group, L.L.P., Houston, TX, USA; [f] Upper Limb Unit, Melbourne Orthopaedic Group, Windsor, Melbourne, Australia; [g] Orthopaedic Shoulder and Elbow Surgery, Columbus Community Hospital Orthopaedics and Sports Medicine, Columbus, NE, USA; [h] Asheville Orthopaedic Associates, P.A, Asheville, NC, USA; [i] California Pacific Orthopaedics, San Francisco, CA USA; [j] Orthopaedic Associates of Wisconsin, Pewaukee, WI, USA; [k] Shoulder and Elbow Unit, "D. Cervesi" Hospital, Cattolica, Italy; [l] California Pacific Orthopaedics, San Francisco, CA, USA; [m] Orthopaedic and Trauma Unit, University of Modena and Reggio Emilia, Via Universita, MO, Italy; [n] Knoxville Orthopaedic Clinic, Knoxville, TN USA; [o] Paris Shoulder Unit, Clinique Bizet, Paris, France; [p] Department of Orthopaedics, The University of Texas Health Science Center at San Antonio, San Antonio, TX, USA; [q] Department of Orthopaedics & Sports Medicine, University of Washington, Seattle, WA, USA; [r] The Mountain-Whisper-Light Statistics, Seattle, WA, USA; [s] The University of Texas Medical Branch, Galveston, TX, USA*

Investigation performed at the University of Washington, Seattle, WA.

**Background:** Many different anatomic glenoid components are currently in the marketplace, and new ones are being added each year. Broad-based, multicenter data are necessary to establish the track record for existing components against which the value of new components can be compared. We hypothesized that the clinical outcomes for patients from eleven different centers using an all-polyethylene glenoid component with a fluted central ingrowth peg would demonstrate consistent, substantial and clinically important improvement in comfort and function.

**Methods:** We obtained outcome data on 1270 individual patients from eleven different centers using an all-polyethylene glenoid component with a fluted central peg. Rather than considering the average outcomes over a range of followup intervals in the different studies, we analyzed individual patient outcomes at two discrete time points: one and two years after surgery. We compared the improvement for each patient to published values for the minimal clinically important difference (MCID) and calculated the percent of maximal possible improvement.

**Results:** The mean±SD preoperative scores improved from SST 3±2, ASES 37±15, Constant score 36±16, and Penn score 30±19 to two-year means of SST 10±2, ASES 90±12, Constant 76±13, and Penn 80±24. A high percentage of patients exceeded the MCID in outcome scores (SST: 96%, ASES: 98%, Constant: 94%, Penn: 93%) and obtained at least 30% of the maximum possible improvement (SST: 95%, ASES: 98%, Constant: 91%, Penn: 87%). Clinical outcomes were not worse for the 41% of shoulders with preoperative type B glenoids or for the 30% of shoulders with more than 15 degrees of glenoid retroversion.

**Conclusion:** Surgeons in 11 independent practices were able to obtain robust clinical outcomes in an international group of over 1200 individual patients using a basic all-polyethylene glenoid component to address the range of glenohumeral arthritic conditions encountered in their practices. These data for a standard glenoid component in current widespread use provide a benchmark against which the value of new component designs can be compared.

**Level of Evidence:** Level IV Therapeutic

**Key Words:** glenoid; ingrowth; all-polyethylene; peg; clinical outcomes; Minimal Clinically Important Difference; Percentage of maximal possible improvement.

**Paper #9 JOINT CONTACT CHANGES WITH UNDER-SIZED PROSTHETIC RADIAL HEADS**

***Daniel R. Bachman, MD,*** *Sangeun Park, MD, Sutee Thaveepunsan, MD, James S. Fitzsimmons, BSc, Kai-nan An, PhD, Shawn W. O'Driscoll, PhD, MD, Department of Orthopedics, Mayo Clinic, Rochester, MN, USA*

**Introduction:** When implanting a prosthetic radial head, its long-term articulation with the opposing articular cartilage should be considered. Several studies have explored the effects of prosthesis shape and geometry on radiocapitellar contact profiles. Contact areas and pressures have been found to differ significantly between radial head prostheses and native radial heads. Significant differences in the contact mechanics of nonanatomic and anatomic radial head prosthesis designs have been reported; particularly their contact with the lateral trochlear ridge. These abnormalities might be lessened by down-sizing the diameter of the prosthetic head, which is recommended routinely by some surgeons. Our aim was to evaluate radiocapitellar contact pressures in two different commercially available radial heads both sized according to their respective manufacturers' recommendations as well as under-sized by 2 mm. We hypothesized that radiocapitellar contact pressures would be improved in a nonanatomic prosthesis, but not with an anatomic prosthesis tested in neutral and extension.

**Methods:** Eight fresh-frozen cadaveric elbows were aligned in neutral-extension and loaded with 100 N using a custom testing apparatus. Radiocapitellar contact pressures were recorded using a TekScan® thin-film pressure sensor. Prosthetic radial head replacement was performed with two prostheses: the Anatomic® RH and the Evolve® Proline RH prosthesis. Each design was sized according to the manufacturer's recommendations, and then again using 2 mm smaller radial heads.

**Results:** Representative patterns of contact are illustrated in Figure 1. Average and peak pressures were significantly higher with the Evolve® than the Anatomic® prostheses($p < 0.03$ and 0.02 respectively). Peak pressures (Fig. 2) decreased from 4.2 ± 0.5 MPa to 2.9 ± 0.3 MPa for the Anatomic® RHs and from 5.6 ± 0.5 MPa to 3.9 ± 0.6 MPa when the Evolve were undersized by 2mm. The mean pressures for the Anatomic® RHs (1.4 ± 0.1 MPa) did not change significantly with under-sizing (1.3 ± 0.1 MPa, $p = 0.12$); whereas, the mean pressures of the Evolve (1.6 ± 0.1 MPa) significantly reduced with under-sizing (1.4 ± 0.1 MPa, $p < 0.02$).

**Conclusion:** Both mean and peak pressures were initially high for Evolve® RH sized based on the short axis diameter and were improved with further under-sizing by 2 mm. Peak, but not mean, contact pressures were improved by under-sizing the Anatomic® prosthesis based on the long axis diameter. These findings support the clinical recommendation of some surgeons to undersize the Evolve® prosthesis by 2 mm smaller diameter than the current manufacturer

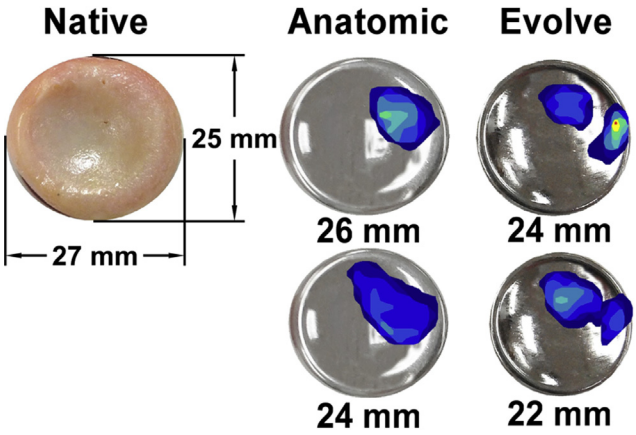


**Figure 1** A set of pressure maps for a representative specimen showing distribution for varying design and size (lighter colors = higher pressures).

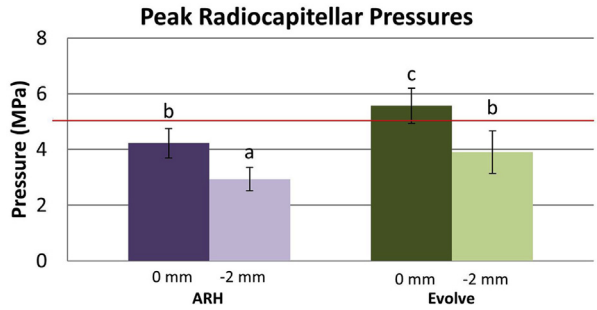


**Figure 2** Radiocapitellar contact pressures (mean ± standard error). 0 mm represents manufacturer suggested sizing, -2 mm indicates under-sizing. Lowercase letters (i.e. a, b, c) indicate the results of post-hoc testing using least squares mean comparisons. Columns with letters in common are not statistically different from one another ($P \leq 0.05$). The 5 MPa threshold is indicated with a horizontal red line.

suggestion and give reason to consider doing the same for the Anatomic® prosthesis.

**Paper #10 PREVENTION OF POST-TRAUMATIC ELBOW STIFFNESS USING BOTULINUM TOXIN**

***Henrik C. Bäcker, MD,*** *Christina Freibott, BA, Eric F. Swart, MD, Charles M. Jobin, MD, Robert J. Strauch, MD, Melvin P. Rosenwasser, MD, Columbia University Medical Center, Department of Orthopedic Surgery, New York, NY, USA*

**Background:** Approximately 30% of all upper extremity fractures are elbow fractures. This may lead to elbow stiffness and heterotopic ossification resulting in limited range of motion which is a challenging problem. A sufficient functional arc of motion is stated for flexion-extension 130°-30°-0° and for pronation/ supination 50°-0°-50°.

**Aim:** To investigate the efficacy of Botulinum Toxin (Botox) injections to prevent postoperative elbow stiffness after trauma, we performed a study in three steps.

**Methods:** All patients were included who presented to a single surgeon with distal humerus fracture, Monteggia fracture, or olecranon fracture. The study was developed in three steps: 1) prospective comparative pilot study to demonstrate the safeness of use and dosage of Botox between 1999 and 2003, 2) double-blinded prospective, randomized study between 2003 and 2007 to evaluate the functional outcome scores and range of motion and finally, 3) a retrospective study between 2007 and 2017 to assess clinical impact and the functional outcome after elbow fracture. For the prospective group, the Disabilities of the Arm, Shoulder, and Hand (DASH) score, Visual Analogue Scale for pain as well as the range of motion (ROM) were assessed after three months, six months and one year. For the retrospective study, range of motion measurements were recorded and analyzed using a paired t-test.

**Results:** In total, 79 patients were included, 32 patients (44%) received Botox injections and 47 patients (54%) were in the control group. The pilot study reported that Botox is a safe and effective method to prevent posttraumatic elbow stiffness, lasting six months, with an optimal dosage of 100 units each for the brachialis muscle and biceps brachii. In the prospective randomized study, a significant difference **($p<0.05$)** in VAS score and high positive trend in DASH score after 1 year **($p=0.06$)** between the botulinum **(VAS 1.2±5.2; DASH 11.18±11.0)** and control group **(VAS 5.7±21.9; DASH 54.46±7.59)** could be identified. For ROM, a positive trend especially for extension could be identified in Monteggia and significant difference in Intercondylar fracture **($p<0.05$)** 6-weeks postoperatively.

**Conclusions:** Botulinum toxin is a safe and promising treatment to prevent post-traumatic elbow stiffness. Our study demonstrates improved early range-of-motion, and better functional outcome like VAS and DASH score.

**Paper #11 COUNTERFORCE BRACING OF LATERAL EPICONDYLITIS: A PROSPECTIVE, RANDOMISED, DOUBLE BLINDED, PLACEBO CONTROLLED CLINICAL TRIAL**

***Martin Kroslak, MBBS, MS,*** *Kajan Pirapakaran, MBBS, , Prof-George AC. Murrell, MD, PhD, Orthopaedic Research Institute, University of New South Wales, St George Hospital Campus, Australia*

**Background:** Counterforce bracing is one of the common treatment modalities for tennis elbow. The objective of this study was to determine whether counterforce bracing offers any additional benefit over placebo bracing in the treatment of tennis elbow.

**Methods:** This prospective, randomised, double-blinded placebo controlled clinical trial investigated the use of counterforce bracing (n=17) compared with placebo bracing (n=14) in the management of acute tennis elbow. Outcome measures included patient rated pain and functional outcomes, epicondyle tenderness and strength at 6 months and long term. Follow up occurred at 2, 6, 12 and 26 weeks, as well as long term (mean follow up 3 years). The study duration was 5 years.