Can Total Elbow Arthroplasty Effectively Treat Post-traumatic Sequelae After Proximal Ulnar or Radius Fracture and Fracture-Dislocations?

Daniel Z. You MD MSc[1], Samuel S. Rudisill MD[1], Bradley W. Fossum MD[1], Michael Baird MD[1], Shawn W O'Driscoll MD PhD[1], Joaquin Sanchez-Sotelo MD PhD[1], Mark E. Morrey MD MSc[1]

1. Department of Orthopedic Surgery, Mayo Clinic, Rochester, MN, USA

Background. In the United States, it is estimated currently that over 50% of total elbow arthroplasties (TEA) are performed for distal humerus fractures, sequalae after distal humerus fractures, or complex fractures or fracture dislocations of the proximal ulna and radius. The outcome of TEA performed for distal humerus fracture or nonunion has been well documented in the literature. On the contrary, there is very limited available information regarding the outcome of TEA for sequelae of complex proximal ulna or radius fractures and fracture-dislocations. This study aimed to (1) identify operative considerations and complications and (2) determine survivorship of TEA for patients with post-traumatic elbow sequalae excluding patients with a prior distal humerus fracture.

Materials & Methods. Adult patients who had undergone TEA for sequelae of proximal ulna or radius fractures with or without dislocation between 1990 and 2024 were identified using an institutional total joint registry database. Patients treated with partial replacement and those who received TEA for acute elbow trauma were excluded. A total of 40 elbows with a mean follow-up of 9 years (standard deviation, SD 6) were included (Figure 1). Their mean age was 59 years (SD 10), and 58% of patients were female. Post-traumatic arthritis secondary to proximal ulna or radius fracture accounted for 80% of cases (transolecranon fracture [n=13]; Monteggia-variant [n=9]; transulnar basal coronoid fracture [n=8]; radial head fracture [n=2]). Complex elbow instability (terrible triad [n=5] and varus posteromedial rotatory instability [n=3]) comprised the other 20% of cases. Prior to TEA, the mean number of operations was 3 (SD 2), and 75% of elbows had either a history of radial head resection (n=18) or a mal-reduced radiocapitellar joint (n=12). 40% of elbows had pre-operative ulnar nerve symptoms. Descriptive statistics were reported using means and SD for continuous variables and counts (percentage [%]) for categorical variables. Implant survival free of revision or resection for infection, mechanical failure or radiographic loosening, and for any reason was estimated with the Kaplan-Meier method and 95% confidence intervals (CI).

Results. When successful, TEA provided adequate pain relief and good restoration of function. However, the overall revision rate was 28%. Operative times were long (mean 158 minutes, SD 74 minutes) and intra-operative difficulty with ulnar preparation was noted in 35% of elbows (n=14). Prior hardware was retained in 23% of elbows (n=9), and 10% of elbows (n=4) required ulnar component modification. In 63% of the elbows, the ulnar nerve had not been addressed prior to TEA. At the time of TEA, the ulnar nerve was either decompressed (n=5) or transposed (n=17). The most common post-operative complications were neurologic complications (20%), aseptic loosening (18%), and deep infection (13%). Ulnar sided aseptic loosening (36%, n=4) and infection (36%, n=4) accounted for 72% of revisions (n=11). At 10 years, implant survival free from revision or resection for infection, mechanical failure or radiographic loosening, and for any reason were 88%, 83%, and 73% respectively (Figure 2).

Discussion. TEA for the salvage of sequelae after fracture and fracture-dislocation of the proximal ulna and/or radius is associated with a 73% rate of survival free of revision at 10 years, comparable to TEA for distal humeral fracture. The procedure is technically difficult related to prior surgery, retained hardware, preexisting ulnar neuropathy, and oftentimes chronic radial head absence. In addition, surgeons performing this procedure need to be prepared to address difficulties with ulnar-sided component preparation secondary to prior ulnar-sided internal fixation, mal-union, and non-union. Infection and ulnar loosening were the main reasons for revision.

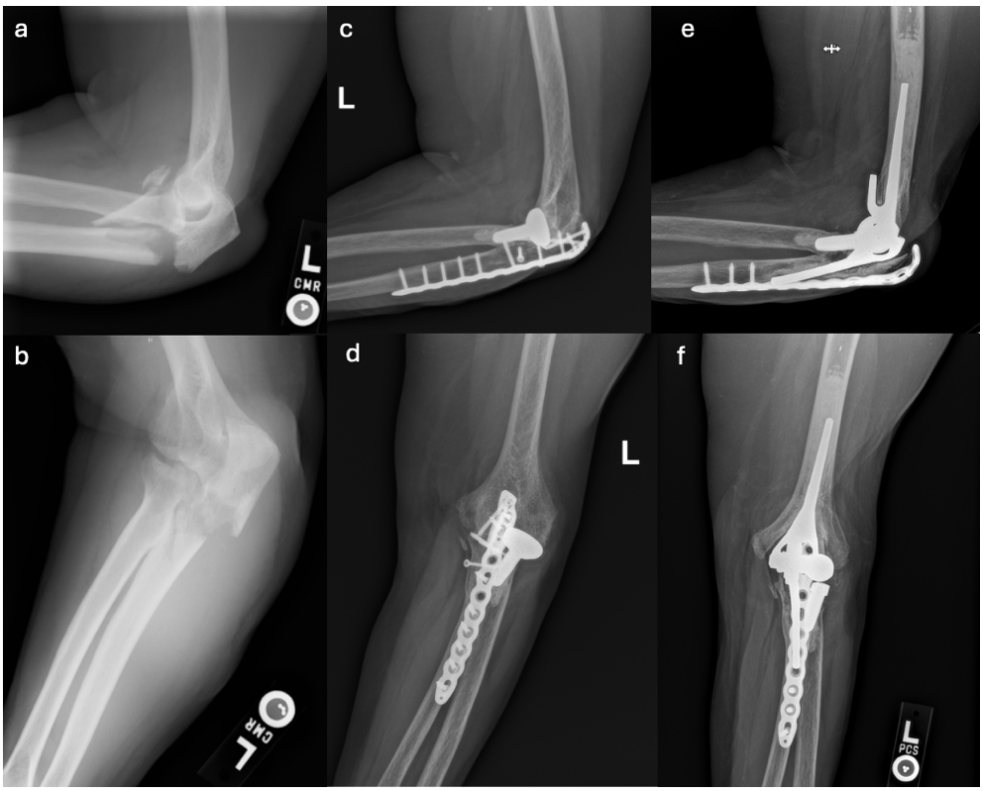

Figure 1. Orthogonal radiographs of a trans-ulnar basal coronoid fracture (a,b) treated with open reduction internal fixation and radial head replacement at an outside hospital referred for painful post-traumatic arthritis (c,d). The patient was treated with a semi-constrained linked total elbow arthroplasty and retained ulnar plate with no radiographic signs of mechanical failure at 5-year follow-up (e,f).

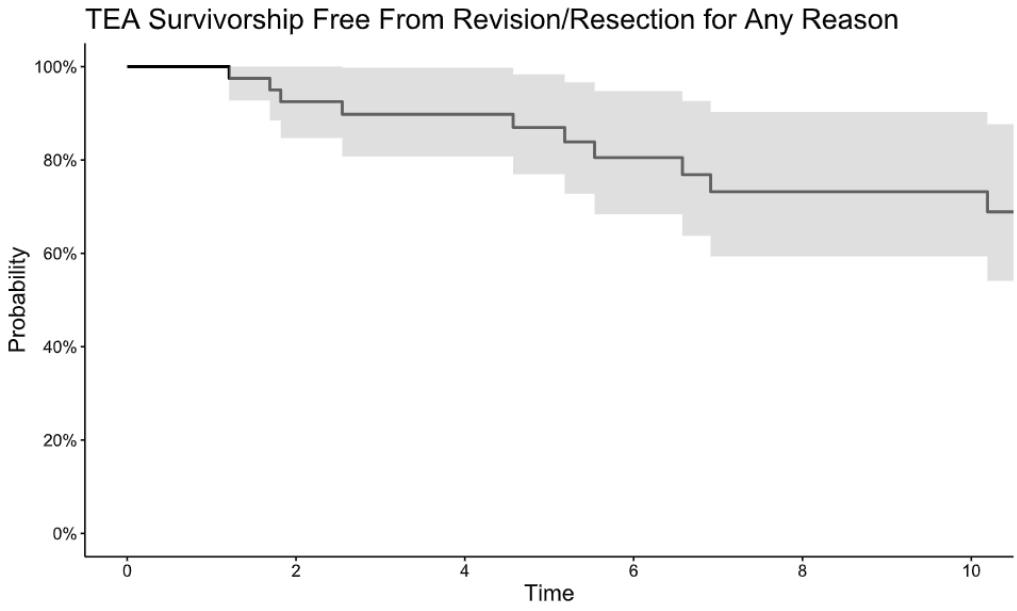

Figure 2. Kaplan-Meier analysis survivorship curve showing a ten-year survival rate of 73% with revision for any reason (including infection) or implant resection as the end point.