Do Patient or Surgical Factors Impact Outcomes After Traumatic Elbow Instability? Analysis of 201 Complex Elbow Fracture-Dislocations

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Purpose: Management of elbow instability remains challenging despite advancements in surgical technique and implant design. Restoration of stability to allow for early range of motion is paramount, yet which factors impact outcomes remains unclear. We hypothesized delayed intervention, combined ulnohumeral/radiocapitellar instability, and increased operative time would increase complications.

Methods: We initiated an IRB-approved multicenter retrospective review of patients ≥18 years old who underwent surgical intervention for elbow fractures with concomitant instability between 2016 and 2022 from 4 Level I trauma centers, excluding those with prior elbow surgery, pathologic fracture, intact joint stability, or <3- month follow-up. Patient inclusion was confirmed by fellowship-trained orthopaedic surgeons after reviewing injury radiographs. Demographics, comorbidities, injury patterns, operative time, postoperative complications, and final range of motion were recorded. Statistical analyses including rank-biserial correlations, Spearman's correlations, and Fisher's exact tests were performed using IBM SPSS software with significance level of $P<0.05$.

Results: A total of 201 patients (47.3% male; age mean [range] = 51.3 [18-93]) met inclusion criteria with transolecranon fracture-dislocations as most common injury (32.7%). Most patients demonstrated both radiocapitellar and ulnohumeral instability (82.3%) and underwent surgical intervention at median of 5.5 days from injury. Postoperative complications included heterotopic ossification (HO) (34.3%), revision surgery (20.9%), neurological deficits (15.3%), surgical site infection (5.5%), and hardware failure (4.5%). Prolonged operative time was associated with increased incidence of revision surgery ($r = 0.301$, $P = 0.014$) and decreased elbow extension ($r = 0.469$, $P<0.001$) and supination ($r = –0.308$, $P = 0.033$). HO development, also associated with decreased elbow extension ($r = 0.327$, $P = 0.007$) and supination ($r = –0.356$, $P = 0.013$), was correlated with ligamentous repair ($P = 0.028$), but not isolated bony fixation procedures or revision surgery. Time from injury to surgery, injury pattern, and radiographic instability were not significantly correlated with complications.

Conclusion: Prolonged operative time was associated with reduced elbow mobility and greater revision surgery incidence. Ligamentous repair to restore joint stability paradoxically increased the risk of HO and stiffness. The data support that surgical decision-making, not patient's injury pattern, markedly impacts outcomes. This data provides impetus for greater efforts to develop standardized algorithms for the surgical management of complex traumatic elbow instability.