Terrible Triad of the Elbow: Repair of the Coronoid Fracture Precludes Needs for External Fixation

Amelia R Goldstein, Benjamin Hammond, Abhishek Ganta, Sanjit R Konda, Kenneth A Egol, Nirmal C Tejwani

INTRODUCTION:
The terrible triad injury of the elbow—comprising posterior dislocation with associated fractures of the radial head and coronoid process—has historically posed significant challenges due to its inherent instability and high complication rates. Earlier treatment protocols often involved staged reconstruction or external fixation to address persistent instability, particularly when the coronoid fragment could not be adequately reconstructed. More recently, advancements in surgical technique and implant design have highlighted the biomechanical importance of the coronoid process in resisting varus and posteromedial rotatory forces, leading to a shift toward direct repair of the coronoid as a cornerstone of surgical management.
METHODS:
A retrospective review was performed of adult patients who underwent treatment for a terrible triad injury via a standardized protocol that included a change in previous algorithm to now include: open reduction of the joint, suture lasso repair of the coronoid fracture, radial head fixation/ arthroplasty and lateral ligamentous repair with suture anchors at our institution between 2012 and 2024. Only patients with a minimum follow-up of six months were included.
Demographic data (age, sex, BMI, and Charlson Comorbidity Index [CCI]) were collected alongside documented complications (infection, nerve injury, periprosthetic fracture, and nonunion). Clinical assessments of elbow range of motion (extension, flexion, supination, and pronation) and Mayo Elbow Performance Index (MEPI) scores were collected with minimum six months follow up postoperatively. X-ray reports were assessed for the development of post-traumatic osteoarthritis (PTOA) based on a radiologist's assessment.
RESULTS:
A total of 74 patients met the inclusion criteria, with a mean age of 49.7±15.3 years and an average follow-up of 11.1±7.1 months. The cohort was 47.3% male and 52.7% female, with a mean BMI of 28.3±6.6 kg/m² and a mean age unadjusted CCI of 1.45±0.95. Of note, none of these patients required use of external fixation following repair.
At latest follow up, the mean range of motion measurements were 123.4°±17.2° of flexion, -19.3°±13.0° of extension, 75.1°±22.5° of pronation, and 70.3°±25.0° of supination. The mean 6-month MEPI score was 89.5±15.4. Within this cohort, 24.3% (17/74) patients developed PTOA at a 13.3±11.6-month FU.
29.7% (22/74) of patients underwent at least one secondary operation, which included: elbow contracture releases (+/- HO excision and hardware removal) (n=12), unplanned hardware removals (n=8), radial head arthroplasties conversion following fixation (n=4), post injury ulnar nerve decompressions or transpositions (n=2), revision open reduction and internal fixations (n=2), and nonunion repairs (n=1).
DISCUSSION AND CONCLUSION: The move to coronoid repair as part of the revised algorithm for treatment of TT injuries resulted in intraoperative stability precluded the need for external fixation. The TT injury of the elbow, however, remains highly associated with the need for multiple surgical interventions. Despite this and the development of PTOA, ultimate elbow ROM was within acceptable range.