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# Heterotopic ossification formation after fracture-dislocations of the elbow



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**Background:** Heterotopic ossification (HO) is a serious complication of traumatic elbow injuries, particularly fracture-dislocations. Limited data exist in the literature regarding the risk factors associated with HO formation in these injuries. The purpose of this study was to review the incidence of HO after fracture-dislocation of the elbow and to identify potential risk factors associated with its formation.

**Methods:** Twenty-seven patients (28 elbows) were surgically treated for elbow fracture-dislocations during 8 years, with an average follow-up of 14 months. Records were reviewed with attention paid to several factors: demographic data, comorbidities, time interval from injury to surgical intervention, number of closed reductions attempted before surgery, surgical approach, management of the radial head, treatment of the anterior capsular injury, and coronoid fixation.

**Results:** Of the 28 elbows, 12 (43%) developed HO postoperatively; 9 of 28 elbows underwent multiple attempted closed reductions before definitive surgical stabilization, with HO formation in 7 of the 9 (77%). Time to surgery, age, gender, radial head fixation or replacement, coronoid open reduction and internal fixation, capsular repair, and medical comorbidities were not found to influence HO formation, although the performance of multiple reductions was identified as a risk factor.

**Discussion:** HO developed in 77% of patients with multiple attempted closed reductions. We found a 43% incidence of HO in patients surgically treated for elbow fracture-dislocations. Neither time to surgery after the injury nor demographic or other factors relating to the manner in which associated osseous or soft tissue injuries were managed influenced the formation of HO.

**Level of evidence:** Level IV, Case Series, Prognosis Study.

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**Keywords:** Elbow; heterotopic ossification; fracture-dislocation; terrible triad; coronoid; radial head

The formation of heterotopic ossification (HO) is a known complication of elbow injuries, but few studies have reported on its incidence specifically after elbow fracture-dislocations (Figs. 1-3). Several reports have examined the

incidence of HO after elbow trauma, although much of the currently available data were reported from larger groups of patients with heterogeneous injuries of the elbow. One of the earliest studies by Thompson and Garcia<sup>15</sup> noted a 17.6% rate of HO in heterogeneously treated patients with fracture-dislocations. Gaston et al<sup>8</sup> described a 20% incidence of HO in their series of patients with fracture-dislocations. More recently, Ring et al<sup>14</sup> reviewed 11 patients with “terrible triad” injuries and noted a 9% incidence of HO. Pugh et al,<sup>12</sup> who described a standard

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**Figure 1** Anteroposterior view of patient with a fracture-dislocation of the elbow.



**Figure 2** Lateral view of patient with a fracture-dislocation of the elbow.

surgical protocol to treat terrible triad injuries, described a 14% incidence of HO. Neither study attempted to identify risk factors for the formation of HO.

Although there are certain established risk factors for the development of HO, such as injury to the central nervous system and severe burn injuries, there have been few studies that have attempted to identify risk factors for the



**Figure 3** Postoperative lateral view of the elbow after radial head open reduction and internal fixation and ligamentous reconstruction, with subsequent formation of heterotopic ossification.

formation of HO in patients sustaining fracture-dislocations of the elbow. Previously, delay in treatment time between the injury and operative intervention has been noted to be related to formation of HO after these injuries.<sup>5-7,13</sup> Because many patients who develop HO require secondary surgical release or excision to regain motion and function, the development of HO can have a dramatic impact on outcome as well as the added burden of additional procedures. The ability to identify patients at risk for HO formation after elbow fracture-dislocations may be helpful in guiding treatment protocols. The purpose of this study was to define the incidence of HO after operative treatment of elbow fracture-dislocations and to identify risk factors associated with its formation after an elbow fracture-dislocation injury.

## Materials and methods

After receiving approval from our Institutional Review Board, we conducted a retrospective review of the hospital records of 27 patients who sustained fracture-dislocation injuries of the elbow. Each was managed by 1 of 2 surgeons (B.P. and M.H.) at our institution or our affiliate institution, Elmhurst Hospital (Queens, NY, USA). Our patient population consisted of 16 women (59%) and 11 men (31%), ranging in age from 15 to 78 years (mean, 46 years). The patients were observed for an average of 14 months (range, 8-32 months). Of the 27 patients, 23 (85%) sustained a terrible triad injury, defined as a coronoid fracture, a radial head fracture, and an ulnohumeral dislocation, with 1 patient sustaining bilateral terrible triad injuries. Of the remaining 4 patients, 2 (8%) sustained capitellar fracture-dislocations, whereas the other 2 sustained coronoid fracture-dislocations. After operative treatment of their injury, no patients were given oral prophylaxis (indomethacin) to prevent HO. All patients began physical therapy in a standardized fashion. Patients who suffered concomitant head injuries or burns or had sustained prior injury to the affected elbow were excluded from analysis.

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