

## Is Time to Surgery in the Fixation of Diaphyseal Humeral Fractures a Risk Factor in the Development of Iatrogenic Radial Nerve Palsy?

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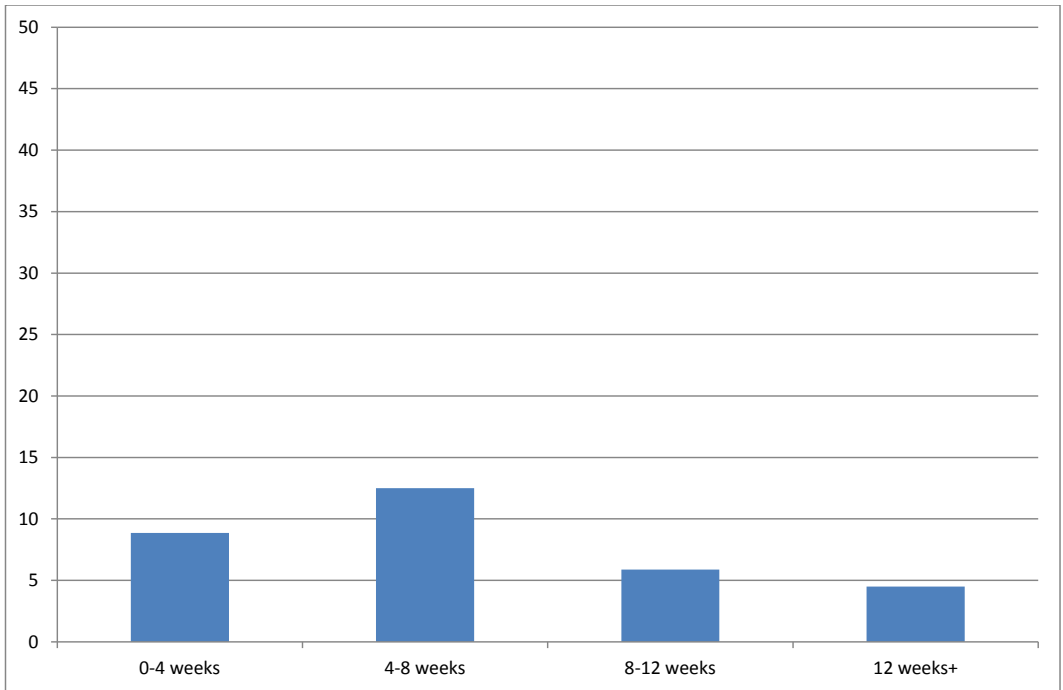
**Purpose:** A radial nerve palsy is the most common peripheral nerve injury associated with diaphyseal humerus fractures. It may occur during the injury itself or iatrogenically following fracture fixation. While some factors have been associated with iatrogenic radial nerve palsies, such as distal location of the fracture, to our knowledge no study has evaluated the timing of surgery as it relates to the risk of developing a radial nerve palsy. The purpose of this study is to determine if time from injury to surgical approach to the humerus is associated with the risk of iatrogenic radial nerve palsy. The null hypothesis is that time is not correlated with the risk of radial nerve palsy.

**Methods:** We performed a retrospective study of all patients treated for either an acute diaphyseal humerus fracture or a humeral nonunion at 2 Level I trauma centers between December 2001 and February 2015. Exclusion criteria were preoperative radial nerve palsy, concomitant brachial plexus or spinal injury preventing accurate assessment of the etiology of the radial nerve palsy, ipsilateral hemiplegia, cognitive impairment precluding the ability to participate in a physical examination, and traumatic ipsilateral upper extremity amputations. The medical record was reviewed and patients were contacted and interviewed in cases where the medical record was incomplete.

**Results:** 325 patients were included in the study. The overall risk of iatrogenic radial nerve palsy was 7.7% (25/325). Time to surgery was not significantly associated with the occurrence of a radial nerve palsy. In a multiple variable analysis, when comparing patients treated within 4 weeks to those treated in 4-8 weeks ( $P = 0.41$ ), 8-12 weeks ( $P = 0.94$ ), and over 12 weeks ( $P = 0.20$ ), there were no significant associations. While not significant, there was an overall trend toward a decrease in the risk of radial nerve palsy in fractures and or nonunions treated 3 months or longer following the initial injury. Independent risk factors for iatrogenic radial nerve palsy included distal location of fracture ( $P = 0.04$ , odds ratio [OR] 3.71) and previous fixation ( $P = 0.03$ , OR 3.80). Age ( $P = 0.49$ ), sex ( $P = 0.71$ ), body mass index ( $P = 0.06$ ), Charlson comorbidity index ( $P = 0.74$ ), nonunion ( $P = 0.59$ ), open injury ( $P = 0.16$ ), fracture class ( $P = 0.75$ ), and use of a block by anesthesia ( $P = 0.50$ ) were not associated with iatrogenic radial nerve palsies. Of the 25 iatrogenic nerve injuries, 22 recovered fully with expectant management, 1 was lost to follow-up, and 2 required either nerve graft or tendon transfers.

**Conclusion:** Time to surgery does not appear to be a risk factor for developing an iatrogenic radial nerve palsy. We had initially hypothesized that a delay in surgery may make the exposure more difficult due to scar tissue and callus formation. Despite this anecdotal experience, there does not appear to be an increased risk in waiting to perform surgery on

humerus fractures. Patients with distal fractures, and those who have previous fracture implants, are at increased risk for iatrogenic nerve radial palsy.



**Figure 1.** Percent of patients who developed an iatrogenic radial nerve palsy following fixation of a humeral shaft fracture grouped by weeks from injury to surgery.