

Optimal Surgical Approach for the Surgical Fixation of Extra-Articular Humeral Shaft Fractures to Minimize Iatrogenic Nerve Injury

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Purpose: We sought to identify if surgical approach and lateral intermuscular (IM) septum release affected incidence of iatrogenic nerve injuries when surgically treating extra-articular distal humerus fractures (EADHFs) with metadiaphyseal extension. We suspect there would be lower incidence of iatrogenic radial nerve palsy when a lateral IM septum release was employed with surgical approach.

Methods: All surgically managed humerus fractures were reviewed from 2010-2018 at a single Level-I trauma center to identify all EADHFs (AO/OTA 12 and 13A2/A3). Two cohorts were compared: Group A, 37 patients treated by 6 different surgeons from 2010-2018 with various approaches (anterior, posterior, or intramedullary nailing) but without release of the lateral IM septum; and Group B, prospectively enrolled cohort of 33 patients treated from 2015-2018 by a single surgeon employing lateral IM septum release for every case. Only 2 approaches were employed in this cohort: lateral paratricipital approach for all distal EADHFs and modified anterolateral approach for all proximal EADHFs with diaphyseal extension.

Results: Preoperative nerve palsy rates (total, radial, and ulnar) were similar between Group A (4/37, 10.8%; 4/37, 10.8%; 1/37, 2.7%) and Group B (3/30, 10%; 3/30, 10%; 0/30, 0%); $P > 0.05$. There were no postoperative nerve palsies in Group B. Group A had higher postoperative nerve palsy rates compared to Group B (0%): total nerve palsy (11/33, 33.3% vs 0/31), radial nerve palsy (7/33, 14.7% vs 0/31), and ulnar nerve palsy (6/36, 10.8% vs. 0/34), all $P \leq 0.026$. Subgroup analysis by approach demonstrated that the total postoperative nerve palsy rate was higher in the Group A anterior approach versus Group B modified anterolateral approach, but only trended toward statistical significance (2/6, 33.3% vs 0%; $P = 0.088$). Group A posterior approaches had a statistically significantly higher total postoperative nerve palsy rate than group B (10/23, 43% vs 0%; $P = 0.002$). Group A posterior approaches were subdivided into the following groups: triceps split, olecranon osteotomy, medial and lateral paratricipital, and lateral paratricipital alone. When compared to the Group B lateral paratricipital, Group A triceps split had higher postoperative nerve palsy rates: total nerve palsy (4/6, 66.7%; $P = 0.002$), radial nerve palsy (3/6, 50%; $P = 0.011$), and ulnar nerve palsy (2/7, 28.6%; $P = 0.06$). Group A medial and lateral paratricipital approach had a higher ulnar nerve palsy rate (3/7, 42.9%; $P = 0.012$).

Conclusion: For AO/OTA 12 and 13-A2/3 fractures, release of the lateral IM septum during surgical fixation of EADHFs decreases iatrogenic radial nerve injury incidence. Lateral paratricipital approach decreases both radial and ulnar iatrogenic nerve injuries when compared to triceps-split approach. Lateral paratricipital approach decreases iatrogenic ulnar nerve injury rate compared to combined medial and lateral paratricipital approach.