

Feasibility of Pre-Operative Neurovascular Examination in Pediatric Elbow Fractures

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Abstract

A detailed pre-operative examination of a child's neurovascular status following pediatric elbow fractures is critical to the assessment of these injuries. Without proper documentation of the preoperative exam, apparent postoperative changes in the neurovascular examination may be difficult to determine, and may dictate different treatment strategies. The purpose of this prospective study was to determine how frequently a complete neurovascular exam could be completed in children with elbow fractures and what factors contribute to the inability to complete an exam. A detailed, specific elbow fracture History and Physical form was developed for prospective use on all pediatric elbow fractures in a tertiary care pediatric trauma hospital. There were 163 patients meeting the inclusion criteria. Attempted neurovascular (NV) exam was documented in 146 of these patients (89.6%). A clinically reliable, complete NV exam was possible in 104 patients (71.2%). A significant correlation was found between age of the subject and ability to obtain a complete exam, with younger children less than age 5 being more likely to have incomplete information on the NV exam ($p < 0.000001$). Although a complete and detailed NV examination is considered necessary when evaluating pediatric elbow fractures, over a fourth of our patients (29%) were unable to reliably participate in a full preoperative NV exam. Neurovascular examinations in the setting of elbow fractures in children less than five years of age were unreliable and incomplete.



Figure 1: Preoperative radiograph of supracondylar humerus fracture

Introduction

- Elbow fractures are the most common type of fracture in the pediatric population.
- Incidence of neurologic (11%) and vascular (.3-4.6%) complications with elbow fracture are high.
- Performance and documentation of complete pre-operative neurovascular examination is critical to the management and treatment of pediatric elbow fractures. However, assessment of young children in pain is extremely difficult.
- Purpose: To determine how often pediatric orthopaedic surgeons can obtain a pre-operative neurovascular examination in children with elbow fractures, and what factors contribute to the inability to complete this examination.

Methods

- Prospective chart review at tertiary care children's hospital
- Elbow specific history and physical form developed and implemented prior to study

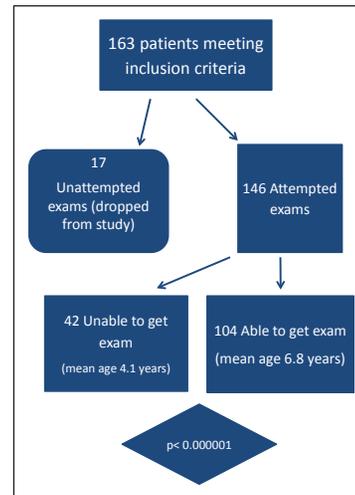


Figure 2: Patient pool and groupings

- Identified all children treated operatively for elbow fractures over a 13 month period, collected data on demographics, diagnosis and treatment information, and neurovascular exam completeness.
- Analyzed collected data for rates of incomplete examination as well as correlations between inability to obtain complete examination and patient specific variables

Results

- Of 163 patients meeting inclusion criteria, complete neurovascular examination was attempted in 146 (89.6%)
- 104 subjects had completed NV exam (71.2%)

Mean Age	5.9 years
Gender Distribution	
Male	48.6% (n=71)
Female	51.4% (n=75)
Ethnic Distribution	
Hispanic	47.3% (n=69)
Caucasian	38.4% (n=56)
Native American	7.5% (n=11)
African American	4.1% (n=6)
Asian	1.4% (n=2)
Other	1.4% (n=2)
Pre-Existing Medical Comorbidity	21.2% (n=31)
Prior Orthopedic Injury	5.5% (n=8)
Received Pain Medication	95.6% (n=140)
Fracture Type	
Gartland II SCH	40.0% (n=54)
Gartland III SCH	47.3% (n=69)
Lateral Condyle	10.3% (n=15)
Medial Condyle	5.5% (n=8)

Table 1: Patient Demographics

- We found a significant correlation between age of the patient and ability of the attending surgeon to obtain the full neurovascular exam, with younger children being less likely to have a completed evaluation ($p < 0.000001$).
- Gender, BMI, Degree of Injury and ethnicity (as a surrogate for potential language barrier) had no effect on whether or not the exam was performed.
- As there were only 5 patients who did not receive pain medication prior to the exam, we could not make any conclusions about the effect of premedication upon exam completion.

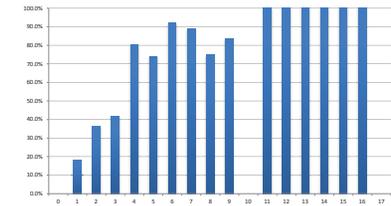


Figure 3: Rates of complete neurovascular examination as a function of patient age in years.

- Three unique age ranges were identified. Patients aged 0-4 years, 4-10 years, and >10 years. Within this classification, surgeons were able to obtain exams at rates of 31%, 82%, and 100% respectively.

Discussion and Conclusions

Although it is ingrained in our training to obtain a complete and detailed neurovascular examination when evaluating pediatric elbow fractures, we found that these were not obtained in over a fourth (28.8%) of the patients. This is likely due to the difficulty of examining a traumatized, frightened child. We found the age of a child to be an important contributing factor. Other demographic descriptors such as BMI, Gender, and Ethnicity had no effect on whether or not the exam was performed.

Rates of examination completion and documentation were much higher than in prior similar studies. These differences could be due to many factors.

- Our hospital is in the Southwest United States. Prior studies were conducted in the UK.
- Exams in our study were performed by attending orthopaedic surgeons. Prior studies evaluated ED personnel and general orthopedists.

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