

Utility of Fast MRIs in Pediatric Elbow Injuries

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INTRODUCTION: Fractures and dislocations of the pediatric elbow present a diagnostic challenge for clinicians due to the cartilaginous anatomy of the skeletally immature elbow. Missed subluxation or dislocation of the radiocapitellar joint in children can lead to functional limitations and serious long-term complications. Radiographs may be insufficient in assessing the radiocapitellar alignment and advanced imaging or invasive procedures such as an intraoperative arthrogram may be indicated. However, these procedures are associated with risks of anesthesia and increased costs. Fast MRI protocols have been developed to decrease costs and scanning time in various clinical applications, and we have used them for musculoskeletal applications at our institution. These sequences can be performed without anesthesia and allow for rapid assessment of musculoskeletal anatomy. There are currently no studies to our knowledge assessing the utility of fast MRIs in pediatric elbow injuries. The purpose of this study is to describe the application and utility of fast MRI in the diagnosis and management of elbow injuries in pediatric patients.

METHODS: We reviewed all pediatric patients who underwent a fast MRI of the elbow between 2014-2022. A fast MRI was defined as an MRI using rapid sequences, accelerated conventional sequences, or fewer conventional sequences than a standard exam. Exclusion criteria was imaging for infectious workup. Charts were reviewed to identify demographics, timing of exams, and clinical course.

RESULTS: Twenty-four patients were identified. The mean age was 5 (range 2-12 years, SD 2.0) and 9 (37.5%) patients were female. All patients had radiographs and 4 had CT scans prior to MRI. All MRIs were obtained to assess for reduction of the radiocapitellar joint. The average time from date of injury to MRI scan was 10.0 days (SD 12.6). The average scanning time was 14.2 minutes (SD 6.5). Only two patients (8.3%) required anesthesia. Most patients (22/24) had a fracture identified on elbow radiographs: Monteggia fracture-dislocation (12), fractures of the radius and ulna (4), medial epicondyle fracture (2), radial neck fracture (2), and olecranon fracture (2). Ten of these patients demonstrated persistent subluxation of the radiocapitellar joint requiring operative management in 9 patients, and one additional patient underwent surgery for displaced radial neck fracture. Two patients sustained an elbow dislocation without fracture identified on radiographs; of these, one had persistent radiocapitellar subluxation on MRI requiring surgical management. A total of 11 patients (45.8%) ultimately required operative treatment due to MRI findings.

DISCUSSION AND CONCLUSION: We report the first pediatric series of fast elbow MRI protocol. Fast MRIs can change treatment course and prevent complications of missed elbow dislocations. This novel imaging technique has the potential to change clinical management, decrease the need for unnecessary procedures, and prevent complications of missed fracture-dislocations in pediatric patients. It has significantly low morbidity since it utilizes non-ionizing radiation and can be performed expeditiously without sedation or anesthesia. Additional studies are needed on cost-effectiveness and long-term outcomes.