New Techniques and Emerging Evidence #NT17
Pediatric

A Novel Radiographic Marker of Transitional Skeletal Maturity in Pediatric Patients

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Purpose: There is much debate regarding operative treatment for both-bone diaphyseal forearm fractures in older pediatric patients. Previous research has attempted to determine whether plate osteosynthesis or flexible nailing is the preferred solution after failing non-operative management, typically by comparing complication rates of treatment based on chronological age. This study aims to use a radiographic marker of closed 1st metacarpal physis in the presence of an open distal radius physis as a marker of the transitional period. Based on Greulich and Pyle's Skeletal Development atlas, we hypothesize this marks a 2-3 year range between skeletal immaturity and maturity, at which time ideal treatment is not known.

Methods: With appropriate IRB approval, a retrospective chart review was performed of 121 consecutive patients at a single level-one pediatric trauma center aged 12-17 with diaphyseal both-bone forearm fractures that failed non-operative management. All patients met radiographic evidence of the proposed transitional period. Groups were created following radiographic analysis and treatment modality. Complications were documented and analyzed with Fischer's Exact testing.

Results: Nine patients met inclusion criteria: 5 treated with flexible nailing and 4 with plating. There were 2 non-unions in the flexible nailing group with 0 non-unions in the plating group ($p=0.04$) and 2 nailing patients with loss of pronation, compared to 0 in the plating group ($p=0.04$). The plating group had 3 cases of mild and reversible neuropraxia, compared to 0 in the nailing group ($p=0.05$).

Conclusion: It is well documented that chronological age is a poor predictor of skeletal maturity, but it is often utilized to determine whether adolescent patients undergo pediatric versus adult treatment modalities in trauma. This study uses a closed 1st metacarpal physis in the presence of an open distal radius physis to signify the transitional period at which time plating has a statistically significant lower rate of nonunion and impacted ROM compared to flexible nailing. Despite limited sample size, preliminary data suggests this could be an easily identifiable marker to help guide treatment, signaling a point of skeletal maturity at which time plating osteosynthesis is preferred over flexible intramedullary nailing.