Pediatric radial head ossification occurs in eccentric fashion

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INTRODUCTION:
Pediatric elbow ossification centers can develop eccentrically but no study has described the ossification pattern of the radial head. This study investigated the geographic pattern of radial head ossification during elbow maturation and described the offset between the radial head and capitellar ossification centers using magnetic resonance imaging (MRI).
METHODS:
Patients under 18 years of age with elbow MRIs performed at 1.5 or 3 Tesla between January 2011 and September 2022 were retrospectively identified. Exams were excluded for deformity or trauma to the radial head. The centers of the cartilaginous and ossified radial head were identified by dividing the maximal anterior to posterior and radial to ulnar dimensions in half. The center of the capitellar ossification center was similarly identified. Radial head offset between the centers of the cartilage anlage and ossific nucleus was measured, as was radiocapitellar offset, and reported in percentages. Pearson correlation analysis was performed to assess for correlation between radial head ossification and radiocapitellar offset with age.
RESULTS:
This study included 66 patients (37 male and 29 female). We were able to obtain images for each age and sex category except for 4 year old females. Approximately 68% of radial head ossification centers were eccentric in the sagittal plane and 71% were eccentric in the coronal plane. Of the patients with eccentric ossification centers, the offset was more often posterior and radial. There was no significant correlation between radial head ossification center location and age in the sagittal plane ($p>0.05$); however, there was a significant correlation between decreasing radial head ossification offset and increasing age in the coronal planein males (Pearson coefficient - 0.608, $p=0.02$). The magnitude of radiocapitellar offset in the sagittal plane was overall small with an average offset of 0.2% for males and 2.6% for females. In the coronal plane, the average radiocapitellar offset was 18% for both males and females. There was no correlation between the magnitude of offset and age ($p>0.05$).
DISCUSSION AND CONCLUSION:
This is the first study to our knowledge to describe the pattern of radial head ossification. Radial head ossification tends to occur eccentrically and does not correlate with age. Eccentric radiocapitellar alignment persists to skeletal maturity but is less in the sagittal plane. The radiocapitellar line remains useful in assessing elbow alignment but the lateral view should be carefully scrutinized.