Analysis of upper cervical spine measurements in the uninjured pediatric spine

Background

Only a small number of studies have offered normative data for the upper cervical spine in children and with some variation in findings. The aim of this study was to determine normal values for upper cervical spine measurements used in the assessment of upper cervical spine trauma in the pediatric population.

Research question

Relevant to trauma, what are the normal upper cervical spine measurements in the paediatric population?

Methods

100 computed tomography scans of the cervical spine on children aged </=16 years were included for analysis. All children were cleared of spinal injury. Anterior atlanto-dens interval (ADI), posterior atlanto-dens interval (PADI), basion-dens interval (BDI), Power's ratio, condylar-C1 interval (CCI) and lateral mass interval (LMI) were measured on the relevant sagittal or coronal images. Measurements for CCI and LMI were taken on each side.

Results

Mean age was 111 months (range 11-196). 62 were male. Mean values (and ranges) of the measurements were: BDI: 7.1mm (3.6-12.2); ADI 2.8mm (0.8-4.8); PADI 18.7mm (14.1-23.2); Power's ratio 0.72 (0.59-1.0); CCI 2.0 and 2.0 (0.5-4.2), and; LMI 3.2mm and 3.3mm (1.7-4.8). BDI (r=-0.488), ADI (r=-0.201), PADI (r=0.264) and CCI (r= -0.468 and -0.454) all showed significant correlation with age. Power's ratio was the most stable measurement across all age groups.

Conclusions

Normal values were reported from a local pediatric population with a wide age range. Most values correlate with age to a degree and so normal values may vary throughout childhood. Current radiographic measures used to assess for possible ligamentous injury in the pediatric upper cervical spine correlate with age. Caution must be held when analyzing the upper cervical spine across a range of age groups in children.