Poster 076

Quantitative Pupillometry and Radiographic Midbrain Compression

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Introduction

Midbrain compression secondary to cerebral edema or hemorrhage results in high mortality and morbidity. Quantitative pupillometry holds promise as a bedside indicator of worsening anatomic tissue shifts. Because pupil reactivity relies on an intact neural network through the diencephalon and brainstem, compression can lead to changes in pupil size and reactivity. We studied markers of compression and pupillometry within 2 hours of head CT in 35 patients with anterior ischemic stroke (AIS) or supratentorial intraparenchymal hemorrhage (IPH) causing mass effect.
Methods

We reviewed 62 scans from 35 patients with unilateral injury from AIS (>1/3 of MCA territory) or IPH (>30 mL). We assessed midline (MLS) and pineal gland shift (PGS), as well as novel measurements of midbrain compression including interpeduncular shift (IPS) and the ipsilateral and contralateral cerebral peduncle hemi-distances to the interpeduncular cistern (ICPHD, CCPHD). Multilevel modeling was used to analyze radiographic measurements with quantitative pupil metrics including pupil reactivity (DNPi) and size (DSize) differences between eyes.

Results

Median age was 68. Fifteen patients had IPH (43%) and 20 had AIS (57%). Median DNPi was 0 [-0.2, 0.2]; median DSize was 0.44 [0.26, 0.78]. MLS was significantly related to DNPi in patients with AIS (β=0.09, p=0.009) and DSize in patients with IPH (β=0.09, p=0.005). PGS had no significant association with pupil metrics. In the AIS cohort, IPS was highly associated with DNPi (β=0.14, p=0.007) and trended toward significance with DSize (β=0.46, p=0.071). The ratio of the ICPHD/CCPHD was significantly associated with both DNPi and DSize (β=0.82, p=0.004; β=0.29, p=0.016).

Conclusions

Pupil reactivity and size differences were significantly associated with radiographic markers of midbrain compression. Further study is necessary to determine whether DNPi and DSize are sensitive and specific noninvasive indicators of brainstem compression.