Into the eye of the storm: Assessing brainstem distress with the pupilometer

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For decades, neurologists and neurosurgeons have relied on bedside clinical examination of brainstem and flashlight pupillary signs to diagnose critical herniation syndromes that spell impending doom to the neurocritical care patient. In the same way that echocardiography has provided unprecedented point-of-care imaging of the heart, digital pupilometry provides precision and insight into the integrity of the brain stem: the seat of the reticular activating system of the brain. In this talk we will review contemporary data demonstrating the ability of digital pupilometry to monitor and trend herniation states from both increased and low intracranial pressure, extent of midline shift, response to bolus osmotherapy, and prognosis after cardiac arrest. A recent multicenter study from Europe shows that at any time between day 1-3, an NPI (neurological pupillary index) of ≤2 (scale 1-5) implies a 100% chance of a poor outcome, with a 32% sensitivity for poor outcome. The results are potentially serious for the way that we prognosticate cardiac arrest, suggesting that a poor NPI within 24 hours of cardiac arrest suggests a “no hope” situation with regard to neurological recovery. If confirmed, pupilometry NPI could have the same significance as bilaterally absent N20 responses on somatosensory evoked responses (SSEP) as a clear indicator of irreversible damage to consciousness mechanisms after cardiac arrest. Future studies are needed to investigate this issue.