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Pupillometry as a predictor of outcome after hemicraniectomy

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Objective

To study the effect of hemicraniectomy on pupillary changes quantified with a pupillometer and to analyze the impact of these changes on patient outcome

Background

Decompressive hemicraniectomy is used to relieve life-threatening mass effect; evidence-based guidelines support its use in patients with large hemispheric infarction. Pupillary light reflex (PLR) changes can be an indicator of cerebral herniation and often serve as a trigger for hemicraniectomy. Pupillary abnormalities have been found to be a poor prognostic indicator in some, but not all studies of outcome after hemicraniectomy. None of these studies employed quantitative pupillometry and pupil examination using a hand-held flashlight is error prone.

Design/Methods

We performed a retrospective analysis of patients who underwent hemicraniectomy at a University Hospital from November 2016 to July 2018. All patients underwent serial quantitative pupillometry using the NPi-200 pupillometer. The PLR measured by the Neuropupillary index (NPi) immediately before and after craniectomy were noted. The midline shift on CT scans before and after hemicraniectomy was measured. The primary outcome was modified Rankin Scale (mRS) score at discharge. Data were analyzed using SAS v9.4. Means and central tendencies were examined and regression models were constructed to explore for associations.

Results

Of 13 patients (8 female), the mean age was 39.7. Primary diagnosis was ischemic stroke (7), ICH (3), SAH (1), SDH (1), infection (1). Indications for hemicraniectomy were pupil change (6), decreased consciousness (4), increased ICP (2), multifactorial (1). Difference in midline shift (before minus after hemicraniectomy) was predictive of mRS ($r_2=0.15$; $p<0.01$). Improved NPi scores were associated with lower mRS for left eye ($r_2 = .63$, $p<.001$) and right eye ($r_2 = .67$; $p<.001$).

Conclusions

Improvement in NPi after hemicraniectomy is correlated with better patient outcomes at discharge.