

## Poster 71

### Effect of Hyperosmolar Medication on Quantitative Pupil Metrics in Neurological Critical Illness.

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**Introduction:** Hyperosmolar medications have been mainstays of medical management for cerebral edema. While up to 90% of Neurointensivists report using these treatments, few quantitative clinical measurements guide optimal timing, dose, or administration frequency. Their use is most commonly triggered by a qualitative assessment of neurologic deterioration and/or pupil size, and anecdotally appear to improve marked pupil asymmetry suggestive of uncal herniation. However, the subjective nature of these measurements can suffer from poor reliability, making it difficult to detect subtle changes. We hypothesized that in patients with poor pupil reactivity, hyperosmolar medications reproducibly improve quantitative pupil metrics.

**Methods:** We included patients at two centers who received 20% mannitol or 23.4% hypertonic saline in the Neurosciences ICU. Pupil measurements within two hours before and after medications were recorded. The primary outcome was the Neurologic Pupil Index (NPI), a composite metric ranging from 0-5 in which  $>3$  is considered normal. Secondary outcomes included resting and constricted pupil size, pupil size change, constriction velocity, dilation velocity, and latency. Results were analyzed with Wilcoxon Signed-Rank tests, chi square and multi-level linear regression.

**Results:** We studied 71 patients (403 pupil observations). Mean age was 57 and most common diagnoses included intraparenchymal hemorrhage (37%), traumatic injury (16%), and anterior circulation stroke (14%). In 24 patients with NPI value  $< 3$ , NPI of the pathologic eye significantly differed post hyperosmolar (Median 2.40 v 3.0,  $p=0.0004$ ). In a multi-level model, NPI, and resting and constricted pupil sizes remained significantly different irrespective of initial pupil reactivity and when accounting for sedative administration.

**Conclusions:** Pupil reactivity and other metrics significantly improve after hyperosmolar therapy in a heterogenous critically ill population. Understanding the relationship between hyperosmolars and quantitative pupillometry metrics may help noninvasively track the efficacy of hyperosmolar therapy. Future work is necessary to determine dose-dependent effects and clinical utility.