

RESEARCH BYTES

Pupillometry Trends in the Setting of Increased Intracranial Pressure

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In this issue of *Journal of Neuroscience Nursing*, McNett and colleagues¹ report the findings of a secondary data analysis of a prospective cohort, repeated-measures study to determine the trends in pupillometer to intracranial pressure (ICP). This is an excellent study that demonstrates the advantage of pupillometry reading in detecting increased ICP.

Background

Pupillary assessment is the core component of neurological assessment. Pupillometers in critical care settings can provide standardized, trended values to aid critical decision making. Serial pupillometer values have shown correlations with ICP and signs of transtentorial brain herniation and could be important predictors of outcome after cardiac arrest. Few studies have reported pupillary changes in the setting of increased ICP.

Purpose

The purpose of this study was to evaluate trends in pupillometer values in the setting of increased ICP among a cohort of critically ill patients with neurological injury.

Methods

A secondary data analysis of a prospective cohort, repeated-measures study examining correlations between ICP values and pupillometer readings within the first 72 hours of admission to an intensive care unit was conducted. Serial pupillometer readings, which included constriction velocities, Neurological Pupil index (NPI), and pupil size obtained for both right and left eyes, were recorded hourly on all patients as standard of care and documented in electronic medical records. The study was conducted among adults in a level I trauma and comprehensive stroke center. Patient demographics and clinical variables such as age, sex, ethnicity, primary diagnosis, admission Glasgow Coma Scale (GCS) score, intensive care unit and hospital length of stay (LOS), and GCS score at discharge were also recorded.

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The study sample is described using descriptive statistics. Serial, paired values for pupillometer and ICP readings were dichotomized by those recorded when ICP was less than 15 mm Hg and those with ICP of 15 mm Hg or greater, and Student *t* tests were used to compare the mean of these pupillometer readings.

Results

A total of 2107 paired serial pupillometer and ICP readings for the left eye and 2175 for the right eye from 76 subjects were obtained. Most of the subjects were men (61%). The admission diagnosis included epidural hematoma (32%), aneurysmal subarachnoid hemorrhage (25%), intracerebral hemorrhage (20%), acute ischemic stroke (13%), nonaneurysmal subarachnoid hemorrhage (8%), and subdural hematoma (3%). Subjects who experienced increased ICP were generally younger (increased ICP: mean age, 52.3), presented with lower GCS on admission (mean GCS: increased ICP, 4.8; normal ICP, 7.5), had a shorter hospital LOS (mean LOS: increased ICP, 4.8; normal ICP, 21.2), and had lower Glasgow Outcome Scale scores at discharge (mean Glasgow Outcome Scale scores: increased ICP, 2.0; normal ICP, 2.6) than those subjects who did not experience increased ICP.

The study demonstrates a mean reduction in pupillary light reflex in patients with idiopathic intracranial hypertension suggesting that pupillometry reading can be indicative of changes in ICP. In the setting of increased ICP, there were lower constriction velocities for both the right and left eyes (left, $P < .0001$; right, $P = .12$), as well as decreased left pupillary NPI ($P < .0001$) and size ($P < .0001$). Values for right-eye NPI and size were comparable regardless of ICP values.

Implication

Pupil examination is a mainstay of neurological assessment for neuroscience nurses. Although evaluation of pupillometer data yields information about pupillary reactivity, it can also provide insights into ICP elevations in the absence of invasive monitoring.

Reference

1. McNett M, Moran C, Grimm D, Gianakis A. Pupillometry trends in the setting of increased intracranial pressure. *J Neurosci Nurs*. 2018;50(6): 357–361.