Portable infrared pupillometry in critical care

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See related research by Couret et al., http://ccforum.biomedcentral.com/articles/10.1186/s13054-016-1239-z

Abstract
Infrared pupillometry was introduced in 1962 but portable instruments that use this technology have only recently become available in the hospital setting. Questions surrounding the accuracy of these instruments have been addressed by documenting the inter-observer agreement on pupillary measurements and also by comparisons with standard pen-light examinations. The following commentary summarizes the development of these devices and provides a wider perspective on how the pupil and its reflexes might be used in providing care for patients with critical illness.

Keywords: Pupil, Pupillometry, Critical care, Brain injury

Background
Couret et al. [1] recently presented a large observational study comparing automated pupillometry with the standard subjective pupillometry in brain-injured patients. The study confirms previous reports [2, 3] of discordance between these two methods of examining pupillary size, anisocoria, and the pupillary light reflex (PLR). Importantly, the discovery of discrepancy in measurement in both directions as measured by bedside nurses highlights the lack of standardization of this essential examination. As such, there is potential for unnecessary interventions, delays in diagnosis, and adverse clinical outcomes.

Main text
Robert Whytt correctly argued with the influential physician Albrecht von Haller 250 years ago that the PLR required a pathway through the brain. Whytt could not have appreciated why his idea would be so important to physicians in the 21st century, who no longer define life in terms of cardiac function. Light on the retina is a benign non-noxious stimulus and the reflex it produces can be rapidly non-invasively recorded and time-stamped. It is not depressed by paralyzing agents that can confound the assessment of brain stem function by other methods (breathing, eye movements, corneal reflexes). An intact PLR reveals that the observed patient was alive at that time because it confirms the absence of brainstem death. This fact alone justifies special attention to this important reflex.

There is a need for consensus by physicians on what features of the PLR are clinically useful. Some authors rely on the percent reflex [1] while others use constriction velocity [2] or latency of constriction [5]. In judging
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Abbreviations

PLR, pupillary light reflex; PUAL, pupillary unrest in ambient light; RAPD, relative afferent pupillary defect.

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Authors’ contributions

Both authors contributed to writing of the manuscript, and both authors approved the final version of the manuscript.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

No new patient data have been presented.

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Conclusion

Several authors have stated that therapy has been altered because of pupillary signs detected by portable infrared pupillometry, but whether these measurements improved the clinical outcome has never been evaluated. If there is value to patient outcome by learning about the pupil, then it seems logical to obtain accurate measurements, especially when sequential measurements might indicate an evolving pathologic process that would go undetected by other bedside examinations or with imaging studies. Proof of added value from the use of portable infrared pupillometry may be difficult to demonstrate. As an example, most clinicians recognize the value of the pulse oximeter, but it remains a technology that has never been shown to improve outcome [15]. In the end, the value of any precise measurement depends on the clinician’s ability to interpret it. Physicians will eventually have to decide for themselves if precise pupillometry can improve the care of patients with critical illness.
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