Pulse Transit Time: A Useful Clinical Tool?

BY KIMBERLY TROTTER, M.A., RPSGT, ASSOCIATE EDITOR

What is Pulse Transit Time?

Pulse Transit Time (PTT) is the time it takes for the arterial pulse pressure wave to travel from the aortic valve to a peripheral site. It is usually measured from R wave on electrocardiogram (ECG) to the pulse wave arrival at the finger (using oximetric photoplethysmography).

PTT has been shown to represent respiratory effort by detecting changes in the blood pressure oscillations associated with pleural pressure swings (pulsus paradoxus). Blood pressure surges, detected by PTT, have been associated with micro-arousals as well.

History

Pulse Transit Time (PTT) has been used since the 1970s as an indicator of blood pressure changes. Recently, PTT changes have been correlated with arousals. Some research has gone as far as theorizing that changes in PTT may denote arousals without the need for EEG.

Research Results

Many studies include both adult and pediatric populations. Correlations between electroencephalogram (EEG) arousals or sleep fragmentation, increased respiratory effort — esophageal pressure (Pes), thoracic, and abdominal respiratory effort — and PTT changes are shown.

Pediatric Studies

There have been many studies that show a correlation between Pes change and PTT change in children, however, some of these studies discuss limitations in studying a pediatric population, including excessive movement artifact.

In some of these pediatric studies, PTT was shown to be slightly more sensitive to detecting respiratory events than Nasal Pressure (NP) alone.

PTT is non-invasive, and does not disturb sleep or modify upper airway as Pes has been shown to do.

Adult Studies

The adult studies show similar results to pediatric studies. Again, NP was shown to be just slightly less sensitive that PTT in detecting respiratory events, especially upper airway resistance syndrome (UARS) or respiratory effort related arousals (RERAs).

PTT is a desirable measurement for respiratory disturbance because it is non-invasive, and it is semi-quantitative. It has been shown to reveal micro-arousals and increased respiratory effort.

Should it be used in your lab?

PTT can be a useful addition to NP or replacement for Pes, enabling more sensitive monitoring for UARS/RERAs. There are PTT monitors built into some of the sleep monitoring systems, such as the Respironics Alice 5. It is up to the technologist to let the data acquisition system manufacturers know that we are interested in studying PTT as a useful addition or tool for recognizing UARS/RERAs.

References


About the Author

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