

Is it possible for end-tidal carbon dioxide analysis to replace non-invasive blood pressure measurement?

Es posible que el análisis de dióxido de carbono al final de la marea sustituya a la medición no invasiva de la presión arterial?

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To the Editor,

The number and the complexity of interventions performed in the pediatric cardiac catheterization laboratory (CCL) have been increasing in recent years. Anesthesia-related cardiac arrests have been reported as 1.2–8.7 times higher in the CCL than that for events occurring under general pediatric anesthesia¹. Therefore, providing continuous hemodynamic monitoring is the most important issue in CCL.

Radiofrequency ablation (RF) has proven to be an effective method for the treatment of cardiac arrhythmias in pediatric patients and has been used frequently in CCL. The procedure is preceded by an electrophysiological study that performs a systematic analysis of arrhythmias in the basal state and by evaluating the patient's response to programmed electrical stimulation. RF ablation is performed on the abnormal pathway after the arrhythmia has been induced, following an electrophysiologic study and cardiac mapping, which are used to identify and locate the area responsible for the arrhythmia. Interaction between tissue and catheter is crucial for safety and success. Contact force (CF) refers to the contact between the catheter and tissue. Rapid cardiac pacing, or rapid atrial pacing (RAP), improves the stability of and helps better CF². Deep hypotensive periods, which begin and end abruptly secondary to tachycardia, may be observed during periods of RAP and induced tachyarrhythmia. In addition, the type of arrhythmia and cardiac reserve may cause hemodynamic variability. There is a delayed time for detecting

hypotension when only non-invasive blood pressure is monitored for follow-up. This raises the question: is standard non-invasive monitoring sufficient for these patients? Do we need invasive arterial blood pressure monitoring for all patients?

Arterial cannulation for monitoring in children has minor complications, such as localized hematoma, or major complications such as thrombosis, acute interruption of arterial blood supply resulting in permanent ischemia and infection. Therefore, invasive arterial blood pressure monitoring is preferred in selected patients for special procedures. This raises the second question: What other monitoring method can we use to monitor hypotension in pediatric cardiac RF patients?

End-tidal carbon dioxide (ETCO₂) analysis and blood pressure measurement are required according to American Society of Anesthesiologists (ASA) standards for basic anesthetic monitoring³. Continual ETCO₂ analysis is a non-invasive, real-time monitoring as a cardiac-output-related parameter and also assesses the ventilation⁴. ETCO₂ has been found to be well correlated with hemodynamic changes. When minute volume of respiration stays stable, it may be assumed that low values of ETCO₂ may be attributed to changes in cardiac output. Any level of ETCO₂ measured during cardiopulmonary resuscitation correlates with return of spontaneous circulation or survival in adults experiencing cardiac arrest⁵.

Tachyarrhythmia begins and resolves rapidly in radiofrequency ablation. This is rapidly reflected in

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ETCO₂, as well. Hence, continual ETCO₂ monitoring allows us to detect hypotension early by comparing the baseline value.

As a result, the answer stays here; ETCO₂ can be easily used to detect hypotension immediately without waiting for the non-invasive blood pressure measurement time, and early intervention is possible during pediatric RF ablation.

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Conflicts of interest

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Ethical considerations

Protection of humans and animals. The authors declare that no experiments involving humans or animals were conducted for this research.

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