Evidence-based Neonatology Synopsis

Could Heart Rate Variability Expect Extubation Readiness in Preterm Infants?

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CONTEXT

Early extubation of preterm infants is desired by neonatologists nowadays as chronic lung disease and other adverse clinical outcomes have been associated with prolonged ventilation. To date, the decision to extubate remains largely subjective with a failure rate of 20-40%. Heart rate variability (HRV), a function of the autonomic nervous system, has been shown to be reduced in adults who fail extubation. In preterm infants, reduced HRV and heart rate decelerations are more frequent in the preclinical phase of sepsis; but there is no evidence to support its use in extubation.

The study by Kaczmarek et al., aimed at assessing the autonomic nervous system activity using HRV measurements in preterm infants in the immediate period prior to extubation and to compare it in infants who were successfully extubated to those who failed extubation, and to investigate the usefulness of HRV measurements in successfully predicting extubation readiness.

MATERIALS AND METHODS

Multicenter prospective observational study in the United States.

Population

All infants of body weight (BW) ≤ 1,250 g admitted to neonatal intensive care unit (NICU) and require mechanical ventilation with the usual exclusion criteria of major congenital anomalies, congenital heart disease, cardiac arrhythmias, and use of vasopressors/sedation at time of extubation.

Intervention

The respiratory management and the decision to extubate, which was mainly clinical with proposed criteria for extubation, were left to the treating centers and when the clinical decision to extubate is made HRV recordings for 60 min prior to extubation were taken. The recordings were analyzed at different frequencies by a single-blinded investigator. The post-extubation respiratory management was also left for the treating physicians with the proposal to use noninvasive ventilation.

Outcome measures

The sensitivity (Sn), specificity (Sp), positive predictive value (PPV), and negative predictive value (NPV) of each spectral component of HRV in predicting extubation success were calculated. The receiver operating characteristic (ROC) curves were used to assess the ability of the spectral components of HRV to discriminate between extubation success and failure.

RESULTS

A total of 57 infants were enrolled in the study. There were no major differences in the characteristics of the successfully extubated (81%; gestational age (GA): 26.9 ± 1.6 weeks; BW: 923 ± 191 g) group and those who failed (19%; GA: 26.4 ± 1.4 weeks; BW: 876 ± 197) in terms of maternal and antenatal variables, infant variables, ventilator settings, and blood gases prior to extubation except in the inspiratory
Measurements of HRV in the immediate period prior to extubation seem to be a good predictor of extubation readiness in preterm infants. It is more useful when positive indicating extubation readiness as shown by the high specificity and the positive LR, but not so useful when negative as indicated by the low sensitivity and negative LR.

Nonetheless, it is still premature to recommend the routine use of HRV in assessing extubation readiness in preterm infants until it is tested in a large population randomized control trial similar to the trial that tested heart rate characteristic monitoring and early detection of sepsis and mortality reduction in very low birth weight infants.\(^{[4]}\) Furthermore, it would be very interesting if its use in extubation readiness would be reflected on the risk of developing chronic lung disease as an important outcome.

Abstracted from
Kaczmarek J, Chawla S, Marchica C, Dwaily M, Grundy L, Sant'Anna GM. Heart rate variability and extubation readiness in extremely preterm infants. Neonatology 2013;104:42-8.

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