Heart rate changes in neonatal seizures

Cherian et al. report that heart rate monitoring appears to be insensitive for detecting post-asphyxial seizures in neonates. The authors found heart rate changes occurring during 21/169 seizures in 8/14 neonates with subclinical seizures following severe birth asphyxia.

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Heart rate changes and the detection of seizures in the newborn

Commentary by Nirupama Laroia, MD

Studies of epileptic seizures in adults show that autonomic dysregulation (changes in blood pressure and heart rate) are helpful in differentiating pseudoseizures from epileptic seizures.¹ While the basic mechanism of sudden unexpected death in epilepsy (SUDEP) remains unclear, it has been postulated to be associated with rhythm abnormalities or critical bradycardia. Though asystole is infrequent during seizures, case reports describe its association with left hemispheric seizures, whereas right hemispheric seizure onset has been associated with tachycardia. Most studies in adults find an increase in heart rate of at least 10 beats/minute occurring around seizure onset.² This increase has proved useful in seizure diagnosis and automatic seizure detection.

Seizures are more common in the neonatal period than at any other time of life, but are more difficult to diagnose because of the often subtle nature of their behavioral and EEG manifestations. Intensive monitoring has allowed a much closer correlation of EEG activity and behavior than was previously possible. Studies of sinus rhythm heart rate (HR) vari-

ability suggest that feedback control is not fully developed in the newborn infant due to a relative lag in the maturation of parasympathetic influence³ and that HR variability increases in the first 3 days after birth.

Cherian et al.⁴ studied physiologic changes that occur in neonates having seizures from asphyxia. Absolute changes in HR were small, but two patterns of HR variability were recognized: a preserved beat-to-beat variability, and diminished or absent variability that the authors describe as "stable baseline HR." Diminished HR variability has been well recognized as a poor prognostic sign in encephalopathic infants.⁵ Though Cherian et al. did not show any significant differences in mortality between the two relatively small groups, there was a trend to higher mortality in the group with stable baseline HR. This study was limited to infants with asphyxia and no comparisons were made with normal control infants. The role of anticonvulsant drugs on HR variability was also a confounder. As compared to the adult literature, the authors found that ictal HR changes were uncommon and variable (tachycardia, or bradycardia)

without lateralizing/localizing features on the EEG.

Relative immaturity of the newborn brain, limited myelination, and myriad etiologies for seizures in the newborn make extrapolation of results from adult studies difficult. Studies of the influence of the immature autonomic system on pathologic processes like asphyxia, neonatal stroke, and other causes of seizures in the newborn will pave the way for a better understanding of the pathophysiology of neonatal seizures, leading to development of seizure detection algorithms for newborns.

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