The possible role of high-density EEG as a biomarker in neonatal hypoxic-ischemic encephalopathy

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This letter to the editor is on the original article by Ventura et al. and commentary by Pelc. To view these papers visit https://doi.org/10.1111/dmcn.15565 and https://doi.org/10.1111/dmcn.15569.

EDITOR–While commenting on the article by Ventura et al., Pelc mentioned the role of high-density (64 or 128 channels) neonatal electroencephalography (EEG) as a biomarker for developmental trajectories.[1,2] The EEG is non-invasive, portable, and relatively inexpensive compared to serum biomarkers. Serum biomarkers are not only costly, but they require an extra blood draw. Further, the developmental trajectory of serum biomarkers depends on the brain magnetic resonance imaging findings.[3] For example, Li et al.[3] reported elevated plasma Tau levels associated with severe brain injury and dysfunctional cerebral autoregulation in neonates with hypoxic-ischemic encephalopathy (HIE). The prognostication value of Tau is limited as it peaks at 2 to 4 days.[3] Tau was shown to have lower predictive accuracy at 24 hours than at 48 hours.[4] Given the Pelc report, it is prudent that we should look more into the role of high-density neonatal EEG as a prognostic biomarker in newborn infants with HIE. To improve the outcomes in neonatal HIE, therapies should be initiated early. For example, the therapeutic window of the

hypothermia treatment in HIE is during the first 6 to 24 hours. As the Tau and other serum biomarkers have a limited role in the first 24 hours,[3,4] it may not help in the management decision of HIE.

In a recent study, Pelc et al. looked at the effect of brain maturation on the complexity of brain electrical activity measured by multiscale entropy.[5] They recorded EEG signals using a high-density setup (64 or 128 electrodes) in 84 infants born preterm (<32 weeks' gestation) from term age to 2 years and found an increase of strong inter-channel correlation of multiscale entropy ($R > 0.8$) with increasing age suggesting that brain functional connectivity increases with maturation during the first 2 years of life. They also concluded that early extrauterine life experiences (before term age) have a minimal influence on EEG complexity. As the cohort studied by Pelc et al.[5] was infants without HIE, it would be interesting to look at the role of high-density EEG as biomarkers in infants with HIE. It will help in early recognition, treatment, and decision-making, thereby improving the developmental outcome of newborn infants with HIE.

References

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