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Cortical auditory-evoked responses in preterm neonates: Revisited by spectral and temporal analyses

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Abstract

© The Author 2017. Published by Oxford University Press. Characteristic preterm EEG patterns of "Delta-brushes" (DBs) have been reported in the temporal cortex following auditory stimuli, but their spatio-temporal dynamics remains elusive. Using 32-electrode EEG recordings and co-registration of electrodes' position to 3D-MRI of age-matched neonates, we explored the cortical auditory-evoked responses (AERs) after 'click' stimuli in 30 healthy neonates aged 30-38 post-menstrual weeks (PMW). (1) We visually identified auditory-evoked DBs within AERs in all the babies between 30 and 33 PMW and a decreasing response rate afterwards. (2) The AERs showed an increase in EEG power from delta to gamma frequency bands over the middle and posterior temporal regions with higher values in quiet sleep and on the right. (3) Time-frequency and averaging analyses showed that the delta component of DBs, which negatively peaked around 550 and 750 ms over the middle and posterior temporal regions, respectively, was superimposed with fast (alpha-gamma) oscillations and corresponded to the late part of the cortical auditory-evoked potential (CAEP), a feature missed when using classical CAEP processing. As evoked DBs rate and AERs delta to alpha frequency power decreased until full term, auditory-evoked DBs are thus associated with the prenatal development of auditory processing and may suggest an early emerging hemispheric specialization.

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Keywords

auditory-evoked potentials, Delta-brushes, early gamma oscillations, high-density EEG, preterm

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