Auditory brainstem maturation in normal-hearing preterm infants: A meta-analysis

Lottie W. Stipdonk, Nynke Weisglas-Kuperus, Marie-Christine J.P. Franken, Kazem Nasserinejad, Jeroen Dudink, André Goedegebure

Background and Aim

Approximately 40% of very preterm-born children have neurodevelopmental problems later in life. Abnormal maturation of the auditory brainstem in presence of normal hearing might be a marker for these problems. We conducted a meta-analysis on auditory brainstem response (ABR) latencies at term age to describe differences in auditory brainstem maturation between normal-hearing preterm and term-born infants.

Figure 1: A typical ABR wave with response peak I to V connected to their probable localization along the auditory pathway.

Method

Computerized databases were searched for studies published between 1995 and 2014 and reporting ABR measurements at term age in preterm-born infants in a case-control design. We collected I-V and III-V interpeak latency data, representing conduction time of click-evoked waves of neural activity along the brainstem auditory pathway (Figure 2).

Results

Preterm-born infants' III-V interval is significantly longer compared to term-born infants (0.081 ms, effect-size = 0.974), which also reflects on the I-V interval. Moreover, significantly increased ABR interpeak latencies of preterm-born infants are related to lower gestational age and need of neonatal intensive care treatment (Figure 3).

Figure 2: Flow diagram for selection of articles.

Conclusion

- Preterm-born infants have increased auditory conduction time at term age, arising mainly in auditory brainstem
- Lower gestational age and neonatal complications followed up by intensive care treatment negatively affects auditory maturation

Interpretation

- This delayed conduction suggests atypical maturation of the brainstem in normal-hearing preterm-born infants

Future research

- Future research is needed to study the relation between atypical maturation of the brainstem and later developmental problems

Figure 3: Mean differences (and 95% CI's) between preterm and term-born infants on the III-V interval in milliseconds for each study group in descending order of maximum gestational age (Max GA).

Reference: Stipdonk LW, Weisglas-Kuperus N, Franken MCJP, Nasserinejad K, Goedegebure A. Auditory brainstem maturation in normal-hearing preterm infants: A meta-analysis. *Developmental Medicine & Child Neurology*. 2016; 58(10): 1009-15.