

Evaluation of auditory brainstem responses using continuous wavelet transform

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Objectives: To study the usefulness of Continuous Wavelet Transform (CWT) to detect and analyze the peaks of click-evoked Auditory Brainstem Response (ABR).

Background: The ABR is a widely used technique to assess the integrity of the auditory brainstem. Clinically, the waveform is examined by identifying peaks, inter-peak interval, and peak amplitude ratios. The extracted information is then compared with normative data to make a clinical judgment. This consumes a lot of time, effort, and requires extensive training. Hence, there are chances of misinterpretation of the waveform morphology leading to a false diagnosis. The CWT is a time-frequency signal analysis technique that can be used to detect peaks and identify hidden frequency patterns in a waveform with respect to time.

Methods: The data used in this study contained waveforms recorded from 10 typically developing children and 10 children with auditory processing disorder (APD). The CWT was used to generate spectrogram plots of these waveforms. The ABR peaks were located based on the closed contour patterns extracted from these plots.

Results: The extracted frequency patterns from the waveforms of typically developing children were sharp and narrow extending mostly into higher frequencies, whereas in APD kids the patterns were broadly dispersed in low frequencies. Shifted peaks were detected through shifted frequency patterns in the CWT. The observed differences in CWT patterns, between groups could be due to differences in neural synchrony.

Conclusions: The study showed that CWT can be used as a technique to develop algorithms that helps to identify ABR abnormalities and make detailed clinical judgments about APD children.