



Evaluation of the Vivosonic Integrity Device for Auditory Brainstem Response Measurement

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INTRODUCTION

The Auditory Brainstem Response (ABR) is commonly used to estimate hearing thresholds of pediatric patients because neonates and infants cannot provide reliable responses for behavioral measures. ABR is highly replicable and easily identified in an ideal recording environment; however it can be misinterpreted if signals are contaminated with electromagnetic interference, or with myogenic artifact due to a restless child. For this reason, children are normally sedated when tested. The Vivosonic Integrity ABR system was designed to be less sensitive to interference than other commercially available ABR systems, and may be capable of estimating accurate hearing thresholds in non-sedated infants. This capability would provide major benefits to patients, audiologists, and hospitals.

In order to validate this equipment, the ABRs of normal hearing adult subjects aged eighteen to thirty were evaluated both by the Vivosonic Integrity and a conventional ABR system, the GSI Audera. Two conditions were investigated to determine correlation between the devices: a noisy situation, where subjects introduced myogenic noise to the recordings and a quiet, resting situation. Results showed a significant enhancement of the ABR recordings using the Vivosonic Integrity in situations involving myogenic noise. This demonstrates the ability of the Vivosonic system to provide accurate diagnostic analyses on active children so as to avoid the need for sedation and anesthesia.

MATERIALS AND METHODS

Ten normal hearing young adults were included as subjects. Criteria for inclusion included pure tone behavioral thresholds better than 10 dB HL at 0.5 and 4 kHz in the same ear. Auditory thresholds were obtained with tone burst stimuli at 0.5 and 4 kHz on both systems. Two conditions were assessed; quiet, where the subjects rested while reclining, and noisy, where the subjects were instructed to eat a lollipop to simulate a baby drinking from a bottle.

Table 1: Average Behavioral vs. ABR Thresholds in 10 Normal Hearing Subjects

Stimulus	GSI Audera			Vivosonic Integrity		
	Behavioral	Quiet	Noise	Behavioral	Quiet	Noise
500 Hz	14	36	*CNE	17	37	41
4000 Hz	2	14	*CNE	4	15	20

*Could Not Establish: Noise interference precluded data collection for 8 out of 10 subjects

Table 2: Sample ABR Waveforms in Quiet and Noisy Conditions

		GSI Audera	Vivosonic Integrity
500 Hz	Quiet		
	Noisy	*Could Not Establish	
4000 Hz	Quiet		
	Noisy	*Could Not Establish	

*Could Not Establish: Noise interference precluded data collection for 8 out of 10 subjects

RESULTS

The following results were revealed upon analysis:

- I. Useful ABR data were obtained for all subjects in quiet and noisy conditions for the Vivosonic Integrity device.
- II. With a conventional system, clinically useful data were obtained for all subjects in the quiet condition, but only 2 out of 10 subjects in the noisy condition.
- III. With the Vivosonic Integrity device, ABR thresholds in the noisy condition were within 10 dB nHL of thresholds in the quiet condition for all subjects tested. Thus, threshold estimation in noisy condition with Vivosonic Integrity permitted accurate description of hearing status.

CONCLUSIONS

The Vivosonic Integrity device permits estimation of auditory thresholds for low and high tone burst stimulation in noisy conditions simulating movement interference during ABR measurement. Further validation of the device for estimation of auditory thresholds in un-sedated infants and young children is warranted.

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