RUSH UNIVERSITY

ABR Results in Quiet and Active Subjects

Dianne Meyer, PhD, Jennifer Moskop, BA, Amy Winston, AuD, Joanne Schupbach, MS, MA

Introduction and Purpose

Vivosonic, Inc., has introduced innovative ABR instrumentation that features in-situ amplification, weighted filtering, and wireless technology to facilitate testing of non-sedated, active patients (e.g., infants). To date, there is little reported data demonstrating the clinical advantages/performance of the Vivosonic system. This study compared the Vivosonic system to conventional ABR technology on normal hearing adults in both "Quiet" and "Active" conditions.

Methods

Ten normal-hearing young adults (mean age = 26 years) were tested with the Vivosonic Integrity ("novel") and the Biologic NavPro ("conventional") systems in Quiet and Active conditions. In the "Quiet" condition, subjects were relaxed, in supine position, eyes closed, in a darkened double-walled sound booth. In the "Active" condition, they were seated upright at a table, eyes open, in the same booth with lights on and assembling a jigsaw puzzle. Based on previous trials, the puzzle activity impacted the ABR without necessarily eliminating it.

Data Collection

- Test Ear – ear with the better HF PTA. If the ears were similar, the right ear was used.
- Electrode montage – Fz/A1 or A2
- .1ms rarefaction click at 27.7/sec, insert earphones
- Descending order of presentation at 80, 50, 30, 20, 10, and 0dBnHL
- Because the Vivosonic system uses a weighted response and the Biologic uses an artifact-reject response, the number of stimuli was based on time rather than sweeps: Two minutes in the Quiet conditions and four minutes in the Active conditions for both systems.
- Test order alternated between machines and subject conditions.
- Two experienced ABR clinicians independently evaluated the waveforms.

This study was partially supported by Vivosonic, Inc., Toronto, ON Canada

Results

Table 1. Wave V thresholds (dBnHL) for subjects across all conditions. (NP = response Not Present).

Subject	Biologic NavPro (conventional)		Vivosonic Integrity (novel)	
	Quiet	Active	Quiet	Active
Subject 1	10	20	20	20
Subject 2	10	20	10	10
Subject 3	20	NP	30	20
Subject 4	20	30	20	20
Subject 5	20	50	10	10
Subject 6	50	30	30	30
Subject 7	20	20	10	10
Subject 8	50	50	10	20
Subject 9	30	NP	30	30
Subject 10	10	30	20	30
OVEALL MEANS	24	31 (n=8)	19	20
MODIFIED MEANS (#6 & 8 Removed)	17.5	28.3 (n=6)	18.75	18.75

Two-way repeated measures ANOVA showed no main effects for subject state (p= .121) or machine (p=.081). Because two subjects (# 6, 8) had unexplainably high thresholds in Quiet with the conventional system, the ANOVA was repeated with their data removed. A main effect was found for subject condition (p=.03), but not for machine. However , both the overall and modified means for the Active thresholds were markedly better with the Vivosonic machine than with the Biologic. In fact, 4 subjects (# 3,5,8,9) had ABR thresholds in the Active condition that were ≥20 dB better with the Vivosonic compared to the Biologic. Thus, a noticeable trend was present that favored Vivosonic performance in the Active condition.

Table 2. Number of times that Wave V threshold was judged to be normal or poorer than normal in the Active condition

N=8	NavPro/ Active (conventional)	Vivosonic/ Active (novel)
>30dBnHL (poorer than normal)	2	0
≤30dBnHL (normal)	6	8

Significantly more subjects had normal Wave V thresholds with the Vivosonic than with the conventional machine (Chi-square test of independence, p<.05).

Table 3. Wave V latencies at 80dBnHL across test conditions (NP = response Not Present).

Biologic NavPro (conventional)			Vivosonic Integrity (novel)		
Subject	Quiet	Active	Subject	Quiet	Active
	Latency 80dBnHL (ms)	Latency 80dBnHL (ms)		Latency 80dBnHL (ms)	Latency 80dBnHL (ms)
1	5.785	5.8875	1	5.595	5.585
2	5.365	5.1575	3	5.245	5.165
3	5.7	NP	4	5.91	5.325
4	5.595	5.4175	5	5.39	5.245
5	5.45	5.8875	6	5.675	5.77
6	5.66	5.6075	7	5.625	5.575
7	5.51	5.655	8	5.465	5.465
8	5.8	5.8725	9	5.635	5.66
9	5.535	NP	10	5.785	5.885
10	5.95	5.9625	11	5.61	5.705
MEANS	**5.63**	**5.68**		**5.59**	**5.53**

Two-way repeated measures ANOVA showed significant main effect for machine (p=.015), but not for subject condition. Mean Wave V Latencies were statistically shorter for the Vivosonic, but the small differences were not clinically significant.

Conclusions

Within the constraints of this study, results showed some statistical significance and notable clinical trends favoring the Vivosonic performance when subjects were engaged in an activity. These are encouraging findings for pediatric applications, and additional study is recommended.