



# Clinical Experience with New Technology For Recording Un-Sedated ABRs

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## ABSTRACT

We recorded the auditory brainstem response (ABR) without sedation from 103 children using the Vivosonic Integrity device. Neuro-diagnostic and/or threshold ABR measurement was also conducted for 100 adults with suspected non-organic or retrocochlear auditory dysfunction. For over 90% of the children, reliable ABR findings contributed to timely management decisions. Availability of un-sedated ABR measurement altered pediatric referral patterns, reducing demand for ABR with sedation or anesthesia, and significantly reducing wait time. Un-sedated ABR is clinically feasible and valuable.

## INTRODUCTION

The ABR is commonly used to estimate hearing thresholds of infants and young children who cannot yield reliable responses for behavioral measures. ABR may not be feasible without sedation in active children, or findings may be contaminated by movement artifact. The use of sedation and/or anesthesia for ABR recording is associated with a variety of potential clinical disadvantages, among them cost, scheduling delay, and medical risk. The Vivosonic Integrity ABR system was designed to be less sensitive to electrical and movement interference permitting estimation of hearing thresholds in non-sedated infants. We evaluated the feasibility of ABR assessment without sedation in a series of children referred to two audiology services in medical centers. The Vivosonic Integrity has also proven useful in the objective assessment of adult patients referred to the audiology service for possible non-organic or retrocochlear auditory dysfunction.

## MATERIALS AND METHODS

Subjects were a series of 103 children who underwent ABR recording with the Vivosonic Integrity device. Patient age ranged from newborn infants to 7 years (mean of 1.1 years). 53% were males and 47% females. Sleep deprivation techniques were regularly employed, but none of the children received controlled sedatives or anesthetic agents prior to data collection.

Distribution of subjects by state of arousal during ABR recording was: 72% = resting (but not sleeping), 16% = awake and moving; 12% = sleeping.

The ABR test protocol consisted of conventional stimulus and acquisition parameter (including click and tone burst stimulation), but with the addition of special Vivosonic features (Amplitude © electrodes, the Vivolink Bluetooth device, and Kalman filtering).

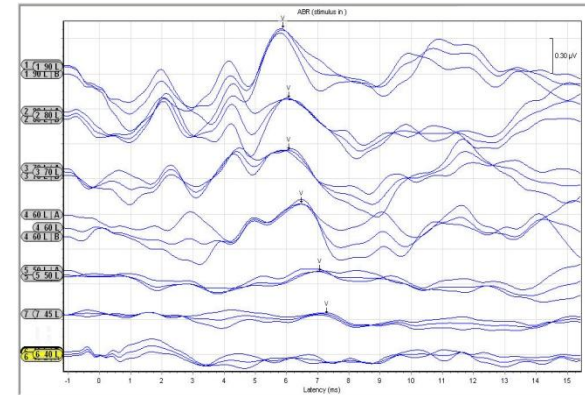
## RESULTS

For 6% of the children, it was not possible to obtain useful ABR recordings due to excessive movement. For the remaining 94% of the children, however, clinically useful ABR recordings were possible. For all children in this group, ABRs were elicited with air-conduction click stimuli with thresholds ranging from 15 dB nHL to no response at 95 dB nHL Useful data were obtained for tone burst stimulation for the following proportions of the children: 500 Hz =24%; 1000 Hz = 36%; 2000 and 4000 Hz = 40%.

Auditory status categorized according to ABR findings was:

- Normal bilaterally= 18%
- Conductive or mixed hearing loss = 38%
- Sensorineural hearing loss = 36%
- Auditory Neuropathy Spectrum Disorder (ANS) = 4%
- Inconclusive hearing loss= 4%

The figure shows a typical ABR waveform recorded from 5 year old un-sedated child (resting but awake) using a 2000 Hz tone burst. ABR findings confirmed a stable mild hearing loss.



## CONCLUSIONS

Our findings and clinical experience support the following conclusions:

- Availability of the Vivosonic integrity reduces the need for sedation or anesthesia by up to 66% for children requiring ABR assessment
- Health care cost reduction of at least 85% is associated
- with performing an ABR in the resting state in an audiology clinic versus under anesthesia in the operating room
- Availability of the Vivosonic Integrity reduces the wait time for ABR assessment from > 2 months to < 3 weeks
- ABR recordings with the Vivosonic Integrity provide useful information contributing to management decisions in over 90% of the un-sedated children scheduled for the procedure

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