Critical review: Can wideband energy reflectance be used in newborn hearing screening to detect transient middle ear dysfunction and to interpret screening results?

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Temporary conditions of the external ear canal and middle ear in neonates can affect sound transmission and lead to "fail" results in newborn hearing screening. The purpose of this review was to determine if wideband energy reflectance could be used as a screening measure to detect middle ear dysfunction in very young infants and to help interpret evoked otoacoustic emissions screening results. Four single gro

reflectance is the ratio of reflected energy at the probe's location to the energy delivered by the probe, and varies from values of 0 (all energy is absorbed) to 1 (all energy is reflected) (Sanford et al., 2009). Typically, reflectance is highest (i.e., closer to 1) for high and low frequencies but lowest (i.e., closer to 0) in the mid-frequency range (Vander Werff et al., 2007). WBR measures present certain advantages over tympanometry in infants, namely that pressurization is not required, it can test a wide range of frequencies, and the measurement can be made quickly using the same equipment as EOAEs (Vander Werff et al., 2007). It is less susceptible to environmental and infant noise than EOAEs (Keefe et al., 2000), and relatively insensitive to how deep the transducer is placed in the canal (Hunter et al., 2010). At present, wideband acoustic transfer functions have been measured in healthy newborns and infants in intensive care (e.g., Keefe et al., 2000), and used to predict ME status in children and adults (Keefe and Simmons, 2003; Piskorski, Keefe, Simmons, & Gorga, 1999), but it is not in widespread clinical use.

Objective

The purpose of this review was to critically analyze the available literature examining the use of WBR in newborn hearing screening to determine if it holds clinical value for detecting ME dysfunction in neonates and for interpreting absent EOAE responses.

Method

Search Strategy

PubMed and EMBASE were searched using the terms (reflectance) AND (neonate 41Tm (t) Tj 41 0 02Tm (i)Tj 41 0 0 41 754 0 Tm (m) Tj 41 0 0 41 0 0 0.2400000 72 345.185 0 Tm (a) T

determining which test had better performance but do not provide sufficient evidence for this review's objective of determining if WBR can be used to detect ME issues in neonates. Although absorbance and reflectance are related, it is unknown if they have different test performance. Importantly, even though the statistical procedures were sound, ambient pressure EA was not able to distinguish between pass and refer groups on Day 2, suggesting inadequate clinical utility. Further, this evidence should be interpreted with caution because not all children who were screened on Day 1 were screened again on Day 2. Hyde (2010) posits that to prospectively determine sensitivity all children who are screened must receive follow-up to determine their true hearing statu

Results for test-retest reliability indicated that mean test-retest differences were relatively small when the probe was kept in place, but were higher for all frequencies after reinsertion. In relating WBR to ME dysfunction, infants who failed the screening had significantly higher WBR from 630 Hz to 2000 Hz than infants who passed. The authors point out that research with older children (e.g., Piskorski et al., 1999) has suggested that this range is important for detecting ME dysfunction. As a result, this finding may indicate that infants who fail

but has normal reflectance scores, the infant should receive an immediate referral for diagnostic testing. Thus, later hearing evaluation would still be needed to clarify and confirm hearing status, even with the use of a WBR test (Keefe et al., 2003a).

Conclusion and Clinical Implications

The potential use of WBR to detect ME dysfunction and interpret screening results in neonatal hearing screening is an appealing prospect, especially in light of the need