Complex Auditory Brain Stem Response in Children with History of Otitis Media with Effusion

Thesis
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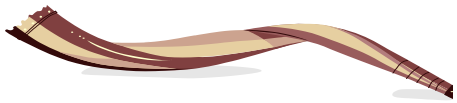

Tamiaa Mahmoud

Contents

List of Abbreviations

Abb.	Full term
ABR	Auditory brain stem response
AOM	Acute otitis media
ASD	Autism spectrum disordres
CANS	Central auditory nervous system
CAPD	Central auditory processing disorders
CI	Confidence interval
CSOM	Chronic suprative otitis media
CV	Constant & vowel
db	Decibels
EAC	External auditory canal
EEG	Electroencephalogram
ET	Eustachian tube
ETD	Eustachian tube dysfunction
F0	Fundamental frequency
FFR	Frequency following response
FFR	First formant frequency
HF	High frequency
HPeV1	Human par echovirus 1
IC	Inferior colliculus

Abb.	Full term
IgE	Immunoglobulin E
IL	Intre leukaine
MEE	Middle ear effusion
NICU	Neonatal intensive care unit
OM	Otitis media
OME	Otitis media with effusion
PCR	Polymerase chain reaction
PLS4	Preschool language scale 4j
PTA	Pure tone audiometry
RAST	Radioallergosorbent testing
RSV	Respiratory syncytial virus
S-ABR	Speech ABR
SOM	Secretory otitis media
TM	Tympanic membrane
TW	Tympanogram width
URI	Upper respiratory tract infection

List of Tables

List of Figures

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Abstract

Background: Otitis media with effusion (OM) refers to inflammation of the middle ear. It occurs in the area between the ear drum (the end of the outer ear) & the inner ear, including the eustachian tube. It is very common in childhood, with the average toddler having two to three episodes a year. **The aim:** To study c-ABR in children having history of otitis media with effusion & To correlate c-ABR with language development & scholastic achievement in children with history of otitis media with effusion, if any. **Method & Material:** control group: comprised fifteen normal hearing children ranged from 6 years to 12 years. They should have normal middle ear functions, No past history of repeated attack of otitis media with effusion, Absence of neurological deficits, Average or above average intelligent quotient (IQ), negative prenatal, natal and postnatal and with normal developmental history (walking, teething, toilet training and normal language development). Study group: Twenty two children with age matched to control group were included in the present study. **Results:** Result of the study pointed to statistically significant difference in Arabic CAPD questionnaire scores and scholastic achievement scores between control and study group. Complex ABR showed significant statistical difference in the VA slope, C,D,E,O latency and FFR between the two study groups. Positive statistical correlation was found between duration of otitis media and complex ABR at VA slope and O latency, language age and listening, language in central questionnaire and scholastic achievement. Also, positive statistical correlation was found between complex ABR and CAPD questionnaire and scholastic achievement. **Conclusions:** children with a history of chronic otitis media with effusion had deficient neural timing in response to the onset and offset of the transient speech stimuli. This might resulting in impairment of speech encoding at the brain stem. That in turn affect on language development, scholastic achievement and auditory processing abilities.

Keywords: CAPD: central auditory processing disorders, c-ABR: complex auditory brain stem response.

Introduction

Otitis media with effusion (OM) refers to inflammation of the middle ear. It occurs in the area between the ear drum (the end of the outer ear) & the inner ear, including the eustachian tube **(Lieberthal et al., 2013).** It is very common in childhood, with the average toddler having two to three episodes a year **(Scott, 2006).**

The rapid onset of signs & symptoms of inflammation in the middle ear is termed acute otitis media with effusion. A middle ear effusion occurs if this effusion last less than 3 weeks it is acute otitis media with effusion, an effusion that last 3 weeks to two to 3 months is called subacute otitis media with effusion. While chronic otitis media with effusion last longer than two to 3 months **(Paparella et al., 1993).**

The presence of OM with effusion may result in many sequalae on hearing, language development, auditory processing & scholastic achievement **(Berman, 2001).** Many cases of chronic otitis media with effusion have the fluctuating nature of hearing loss (which may alternate with periods of normal hearing) leads to an inconsistent sound stimulus to the auditory central nervous system, making it difficult for the child to perceive the sounds of speech

(Santos et al., 2001). Furthermore, fluid in the middle ear can produce noise at the cochlea, distorting the perception of sounds **(Santos et al., 2001).** Language development begins very early, even during its prenatal phase the child is capable of recognizing voices & the sounds of speech. Children with hearing loss resulting from OM with effusion have greater difficulty in acquiring language, less perception of those sounds of speech which contain silent consonants or fricatives such as /s/ & /z/ **(Petinou et al., 2001)** & frequently make phonetic errors in the pronunciation of /l/ & /r/ **(Borg et al., 2002).**

Moreover, **Santos et al. (2001)** reported that Otitis media with effusion might have effect on auditory processing in long-term unilateral conductive hypoacusia leads to binaural auditory processing deficiencies. **Luotonen et al. (2002)** noticed that children with a history of repeated AOM during the first three years of life were making unsatisfactory progress at school in reading, comprehension of texts & verbal & written expression.

The speech- evoked auditory brainstem response offers a uniqued vantage point for assessing auditory function due to its remarkably faithful representation of the stimulus acoustics **(Skoe & Kraus, 2010).** It can be divided into: transient & sustained portions, onset response

components (stimulus onset), & frequency-following response (FFR) **(Kraus & Nicol, 2003).**

Auditory deficits contributing to impaired language & listening abilities in children are likely due to a complex interaction between sensory function & cognition. Once thought to be simply a sensory relay to the cortex, the auditory brainstem has been shown to be vastly malleable through meaningful interaction with sound **(Chandrasekaran et al., 2009).** Due to the complex interaction between sensory & cognitive functions that likely occurs in impaired auditory processing, that might be manifested in children with OM with effusion auditory brainstem measures may be particularly useful in revealing the biological correlates of communication **(Kraus et al., 2010).**

Several researches **Wible et al. (2005), Maruthy & Mannarukrishnaiah (2008)** studied speech ABR in children having otitis media with effusion that revealed abnormal development of brain stem encoding. However, effect of chronic otits media and complex ABR and so forth CAP and scholastics achievement were not addressed before.

Accordingly, this study will investigate the auditory processing patterns objectively using complex ABR in children with history of otitis media with effusion.