Improving Swindon’s Vestibular Diagnostic service by introducing cervical vestibular evoked myogenic potentials, using the B-81 transducer
Dawn Wickenden (dawn.wickenden@nhs.net)

1. Introduction

- cVEMPs are a balance test measuring a reflex in the neck to loud air-conducted (AC) sounds; unreliable if anatomy/pathology inhibits sound transmission

- Bone-conduction (BC) has been used in research with promising results but mixed quality of reporting, high dependence on transducer used

- No recommended protocol so not used in NHS clinics; aim of this project is to determine whether we have enough information about optimal setup to introduce it

Objectives
- Explore existing literature relevant to BC cVEMP setup, focused on equipment available in NHS, & identify gaps
- Assess whether existing data from GWHNFT fills any of these knowledge gaps

2. Methods

Scoping Review
- Searches conducted through PubMed & Scopus looking to identify setup characteristics, across transducers but focusing on what we have (RadioEar B-81)
- "bone conduct* OR BC" AND "vestibular evoked" OR VEMP in title / abstract

Data Analysis
- Pilot data set provided by GWHNFT: 10 participants, BC cVEMPs recorded from both ears at 3 different intensities (75, 65, 55 dBnHL), using 2 variants of stimulus duration (0 or 2 ms ‘rise’/‘fall’, both with 1ms ‘plateau’), ipsilateral & contralateral stimulation
- Descriptive statistical analysis & data visualisation performed through Matlab software

3. Literature Review Summary

Total identified: 412
About BC cVEMP pcs: 130
Using B-81: 16

- Stimulus parameters consistently used/justified: frequency, type (tone burst)
- Parameters varied, not agreed or not mentioned: stimulus duration, intensities tested, polarity (initial direction of vibration)
- Location of transducer relative to test ear (ipsilateral) sometimes stated, but no evidence for choice
- Only 3 of 12 B-81 studies include enough information for experiments to be reproducible 1, 2, 3

4. Pilot Data Results

Amplitude asymmetry ratio between left & right:

$$AAR = \frac{A_1 - A_2}{A_1 + A_2}$$

Maximum ‘normal’ AAR: 0.33

i.e. $$A_1 = 2A_2$$

5. Analysis & Discussion

- Asymmetry is minimised (best) when transducer always on the test ear BUT still valid in a lot of cases if you don’t move the headband between measurements (A)
- Median contra latencies consistently higher than ipsi (C)
- Stimulus duration has some impact on asymmetry (B) and individual response latency (D) at all 3 intensities, HOWEVER the true energy transmitted will be lower than predicted by dBnHL values for stimuli this brief
- Median latencies increase with decreasing intensity for 2:1:2, but 0:1:0 latencies are stable across intensities

- Could this be because intended intensity is not reached, as stimulus duration is too short?

6. Next steps before implementation?

- Measure dBSPL – dBnHL correction factors for range of stimulus durations
- Repeat data collection with equivalent dBSPL intensities rather than predicted dBnHL – isolate relationship between stimulus duration and cVEMP response
- Bigger normative data set to determine normal latency range, AAR, potential confounding factors (e.g. age)
- Data collection on symptomatic cases e.g. conductive hearing loss, balance disorders

6. References