Comparing Auditory Middle Latency Response Using Disc, Bipolar And Tripolar Concentric Ring Electrodes

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Rationale:
Auditory evoked and movement related potentials are signals commonly used in diagnosis of neurological disorders. We compared the auditory middle latency response (AMLR) recorded from disc, bipolar and tripolar concentric ring electrodes and different locations.

Methodology:
Ten healthy volunteers sat relaxed with their eyes closed and were given 33 audio cues per minute. Conventional disc as well as bipolar and tripolar concentric ring electrodes were used to record AMLR. Three 1.0 cm dia. electrodes were used to record from the scalp and a single 1.0 cm dia. electrode on the ipsilateral mastoid process. The scalp electrodes were placed in a line 2.0 cms apart. For comparison, all recordings were from the same locations, virtual disc and bipolar concentric ring electrodes were fashioned from the tripolar concentric ring electrodes. Virtual disc electrodes were created with all rings of tripolar concentric ring electrodes shorted. Similarly bipolar concentric ring electrodes were created using the disc and outer ring of the tripolar concentric ring electrodes. Two sets of positions on the scalp were selected for recording with the three scalp electrodes, i) center electrode located at “Cz” (vertex) & ii) center electrode located at “C3” with an electrode distal 2.0 cm and another proximal 2.0 cm. Recording was perfromed in six different sets back to back, i) disc at “Cz” & ipsilateral mastoid process, ii) bipolar at “Cz” & ipsilateral mastoid process, iii) tripolar at “Cz” & ipsilateral mastoid process, iv) disc at “C3” & ipsilateral mastoid process, v) bipolar at “C3” & ipsilateral mastoid process & vi) tripolar at “C3” & ipsilateral mastoid process.

Results / Discussion:
When a tripolar concentric ring electrode was used to record signals over the ipsilateral mastoid process and disc electrodes were used to record from the “CZ” line, the AMLR present from the disc electrodes was time-aligned with the signal from the tripolar concentric ring electrode. When the tripolar concentric ring electrodes were used for recording, there was always a prominent positive and negative peak present, from the ipsilateral mastoid process, “Cz” line and “C3” line locations. A similar time-aligned signal but with lower amplitude was present at all locations recorded with the bipolar concentric ring electrodes as well. When the disc electrodes were used for recording the AMLR was only present at the “Cz” line. This leads us to believe that tripolar and bipolar concentric ring electrodes can record AMLR from the scalp and from the ipsilateral mastoid process. This finding may decrease preparation time and improve signal quality when recording AMLR to help in diagnosis of neurological disorders.