Superiority of tympanic ball electrodes over mastoid needle electrodes for intraoperative monitoring of hearing function.

Abstract:
Recording the auditory brainstem response (ABR) is a common method for monitoring the integrity of auditory pathways during surgery in the cerebellopontine angle. Electrocochleography (ECochG) is an alternative means of intraoperative neuromonitoring. In the present study the authors compared the practicability and prognostic significance of these two methods by performing simultaneous recordings in the operating room. Between 2006 and 2011, 125 patients (mean age 55 years) underwent surgery in the cerebellopontine angle. Seventy-one percent of the patients presented with a hearing deficit, and 37% had useful hearing but with slight functional impairment. Auditory brainstem response was recorded with a subdermal needle electrode at the mastoid. For ECochG recording, a noninvasive ball electrode was attached to the tympanic membrane. Amplitudes obtained from both ECochG and ABR audiometry were compared and correlated to pre- and postoperative hearing deficits. Simultaneous intraoperative monitoring via ABR and ECochG was possible in 114 cases (91%). Postoperatively, 42% of patients showed some degree of new hearing deficit, whereas 4% had improvement. The mean amplitudes in ECochG monitoring were significantly higher (0.18 ± 0.04 ?V) than the ABR potentials (0.08 ± 0.006 ?V; p< 0.05).
All waves recorded at the mastoid needle electrode could be recognized in the potentials of the tympanic ball electrode. Hearing outcome correlated more reliably with the relative amplitude changes in Waves III and V in ECochG (III: \( p = 0.0008 \), V: \( p = 0.0015 \)) than in ABR monitoring (III: \( p = 0.2075 \), V: \( p = 0.0398 \)). Intraoperative monitoring of the auditory system by recording with noninvasive tympanic ball electrodes is more practicable than with subcutaneous needle electrodes at the tragus. Since there is also a reliable correlation between ECochG and clinical outcome, the method can replace common ABR recording during surgery in the cerebellopontine angle.