**Cochlear implantation: intraoperative monitoring of damage by simultaneous fluoroscopy and electrocochleography**

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**Introduction:** During the last years, indications for cochlear implantation have expanded to include patients with residual hearing. Several factors that reduce the residual hearing after CI surgery have been identified. This study investigated trauma during placement of the electrode array, as reflected by hearing loss. We used implant-based electrocochleography (ECochG) for monitoring the cochlear responses during electrode array insertion while performing per-operative fluoroscopy at the same time to observe the movement of the array inside the cochlea. In addition, video recording of the surgeon’s microscope view was done to capture the surgeon’s actions.

**Objective:** Objectives of this study are to identify trauma or mechanical obstruction during electrode array insertion, as indicated by ECochG responses. The second aim was to better understand the different types of responses in order to improve ECochG interpretation during surgeries without visual electrode array movement feedback. We compared the movements and different ECochG characteristics with the maneuver done by the surgeon. Ideally, the gained understanding of what happens during the electrode array placement will lead to better preservation of residual hearing.

**Method:** For adult patients implanted with different electrodes, ECochG responses were measured during insertion of the electrode array. At the same time fluoroscopy was performed to analyze the movement of the array and to synchronize the movement with the measurements. As third observation microscope video was recorded to track the surgeon’s insertion technique and surgical procedure. Finally, a postop CT scan was performed to analyze the electrode array placement in the cochlea. Pre- and post-op audiograms were obtained up to one year after CI surgery to record the loss of residual hearing.

**Results:** We have successfully monitored the electrode array insertion for 19 patients and were able to identify some causes of residual hearing. There seems to be a strong correlation between loss of ECochG response and loss of residual hearing. In some cases, the loss happened during electrode insertion. In other cases, the loss may have happened already before insertion, while not measuring a response during insertion and loosing residual hearing. In addition, every movement of the electrode array even after insertion has been identified to be critical. For some cases the loss of ECochG response happened after full insertion just before or while packing the electrode array at the round window. Even coiling of the electrode array after sealing of the round window with the muscle has an effect on ECochG response amplitude.

**Conclusion:** The combination of per-operative ECochG measurements, microscope video, fluoroscopy and post-operative CT scan provides valuable information about which steps during the electrode array placement that may cause a reduction of residual hearing. These findings will guide further investigations in order to increase the success rate of preserved hearing.