EXTRACOCHLEAR ELECTRODE ARRAY MISPLACEMENT IN 4 CASES FROM 1380 COCHLEAR IMPLANTATIONS

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Conclusion
The Cochlear Implant (CI) surgeon must be aware of the potential pitfalls and complications of CI. Extracochlear electrode arrays misplacement is a rare complication but it can even be done by experienced surgeons. Also intra-operative plain radiography and neural response telemetry (NRT) are not completely definitive. Therefore intraoperative fluoroscopy and post-operative high resolution computed tomography (CT) may aid the investigation of possible electrode array misplacement in difficult and suspected CI cases.

Introduction
Cochlear implantation is accepted worldwide for the treatment of severe to profound sensorineural hearing loss, and has relatively few reported complications (1). Problems related to the electrode array occur in 0.17–2.12 per cent of CI cases(2). The electrode array may occasionally be accidentally positioned in structures adjacent to the cochlea, due to the small and complex anatomy of the inner ear.

Case Reports
We present 4 cases from 1380 CI of an extracochlear array misplacement into the superior semicircular canal (SSC), middle ear, internal auditory canal (IAC) and Hytril’s fissure. All cases couldn’t diagnosed intraoperatively.

Case 1 (SSC): In the first case there was no cochleo-vestibular anomaly. At surgery, the facial nerve was found to lie more anteriorly than normal, concealing the round window (RW) niche. So that insertion of the electrode was advanced via RW through a narrow cochleostomy with the aim of avoiding facial nerve injury. Intraoperative neural response telemetry and radiograph were performed to make sure that the electrode was in place by looking at the curvature of the electrode. However, the post-op CT showed that the electrode was proceeding to SSC.

Case 2 (middle ear): The second case is neurofibromatosis 2 patient. At surgery, the electrode was moved to the area where it was thought to be RW but post-op CT showed that the electrode was accidentally placed in hypotympanic air cells.

Case 3 (IAC): The third case is referred to our clinic from the external center. There is an incomplete-partision type 1 cochlear anomaly in the patient. After first CI control CT showed that the electrode is in the IAC. Case 4 (Hytril’s Fissure): In the fourth case, there was no known cochleo-vestibular anomaly, but a round window could not be observed during operation. RW, the antero-inferior cochleostomy was performed and the electrode was advanced. At the post-op control CT, the electrode was observed to underly hytril’s (tympanomeningeal) fissure.

Re-implantation was performed with successful revision surgery for all patients except case 3. Because the parents of case 3 wanted the explantation of misplaced CI and not to be a reimplantation.

Discussion
Extracochlear electrode arrays misplacement is a unusual complication. In all cases with electrode misplacement requires revision surgery. The standard location for insertion of the cochlear implant electrode array is into the scala tympani of the cochlea. Failure to insert the electrode array into the scala tympani has been documented in the literature (3-5). Intraoperative plain radiography and NRT are not completely definitive in possible electrode array misplacement. In case 1, intraoperative NRT and even radiography were normal. In case 2, intraoperative radiography was normal. Intraoperative neural response telemetry recordings may suggest cochlear implant failure or nonfunction. The potentials recorded on NRT are usually generated by the cochlear nerve. However, NRT results cannot determine whether the electrode array is placed within the cochlea rather than in the vestibule, because both of them potentials may be similar (6).

On the other hand, the absence of a detectable neural response telemetry threshold is observed in some patients intra-operatively, with post-operative successful functional results. Intra-operative evaluation of electrode array insertion with radiography may be unreliable. The self-curling electrode array had a radiological appearance consistent with appropriate positioning within the cochlea, as in case 2. Intraoperative fluoroscopy and post-operative computerized tomography may be helpful in detecting misplaced electrode arrays in suspected CI cases.

Fig. 1. Electrode array extending into the right SSC
Fig. 2. Electrode array extending into the the left hypotympanic air cells
Fig. 3. Electrode array extending into the the internal auditory canal
Fig. 4. Electrode array extending into the hytril’s (tympanomeningeal) fissure.

References

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