Surgical aspects in postmeningitic cochlear Implantation

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Introduction:

The obliterated cochlea requires high surgical skills (1,10). Labyrinthitis ossificans is the pathological deposition of new bone within the cochlear and labyrintheal lumen. It occurs commonly after bacterial infection or inflammation of the otic capsule (12). Vascular disease or trauma may also lead to ossification (11). Severe cochlear ossification occurs in more than 20% within weeks (8,18).
High definition CT scans are useful for identification and classification of ossification zones but they lead to an underestimation of the extent of ossification in 40-50% of the cases (6,17).
Implantation of a multichannel device could restore useful hearing (2,9).Different surgical options are possible.

Material and Patients:

Two cases are presented with cochlear implantation after bacterial meningitis. The first case is a 9 y old boy deafened after bacterial meningitis at the age of one. A nucleus CI24M device was implanted one month after the meningitis. The second case is a 20 y old man who received a CI24 ST on the right side 3 y after the infection. The array was inserted with 6 electrodes in the second cochlear turn (Fig. 4)
Both patients developed only moderate speech perception and required a second implant.
CT scans showed a localized ossification of the basal cochlea turn and the semicircular canal (Fig.1, 2, 5). The implantation was performed by retroauricular incision, mastoidectomy and posterior tympanotomy.
The basal cochlea turn showed a severe ossification and was drilled out sparing the promontory (Fig.8). In both cases a Cochlear CI 24 RE (ST) was full inserted (Fig. 3, 6,7,9). Speech perception was improved in both cases.

Discussion and Conclusion

High resolution CT scan can show the ossification grade of the inner ear preoperatively. For prediction of ossification the lateral semicircular canal seems to be a more sensitive region than evidence of cochlear involvement. Nevertheless, the absence of radiological ossification signs is no guarantee for a smooth array insertion (17). In both cases CT scans showed less ossification of the basal cochlea turn than intraoperatively verified.
Cochlear Implantation into an ossified cochlea is a challenge, even for experienced ear surgeons (1, 2). Especially the array insertion can be difficult (14, 15, 16). Different procedures are possible. Partial ossification can be negotiated by drilling out the ossification zone of the scala vestibuli or electrode insertion through the scala tympani (3, 5). In cases of extended ossification the promontory should be removed or the array is placed within the second cochlear turn accompanied by fat obliteration of the mastoid (4, 7, 13). For these cases alternative devices should be kept ready, such as short or double array implants (9).
Our cases required a subtotal drill-out of the basal cochlea turn via posterior tympanotomy without removing the complete promontory. The straight electrodes (Nucleus CI 24 RE ST) could be fully inserted in both patients. In summary in these cases a drill-out of the basal cochlea turn is not avoidable but if possible the promontory should be spared.

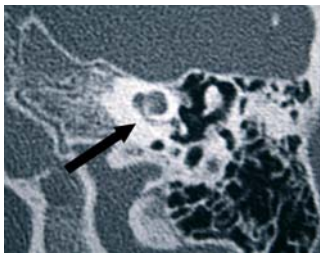

Fig 1. Patient 1; axial CT scan of the left basal cochlea turn with ossification zone (arrow).

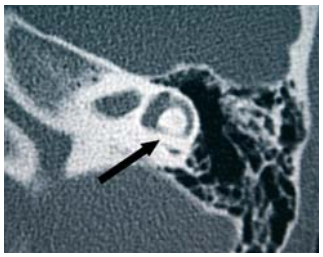

Fig 2. Patient 1; axial CT scan of the left lateral semicircular canal, ossification zone (arrow).

Fig 3. Patient 1 left side; postoperative transorbital view with good insertion of the Nucleus CI 24 RE (ST) array.

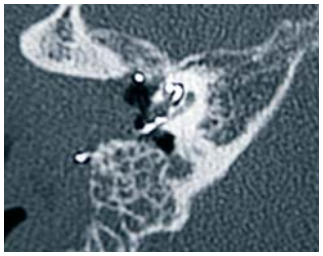

Fig 4. Patient 2; axial CT scan of the right side, fat obliterated mastoid and 6 electrodes placed in the second cochlea turn.

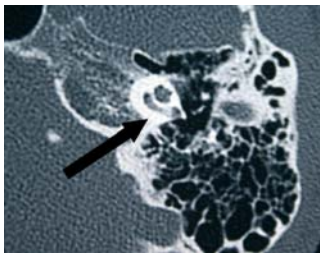

Fig 5. Patient 2; axial CT scan of the left basal cochlea turn with ossification zone (arrow).

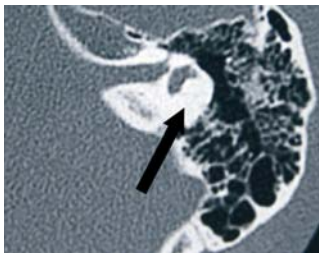

Fig 6. Patient 2; axial CT scan of the left lateral semicircular canal with ossification zone (arrow).

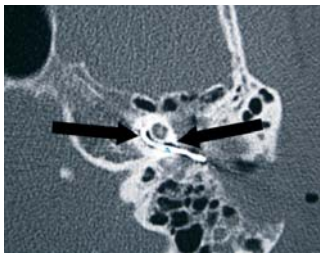

Fig 7. Patient 2; postoperative axial CT scan with drill out zone (between arrows) and fully inserted array.

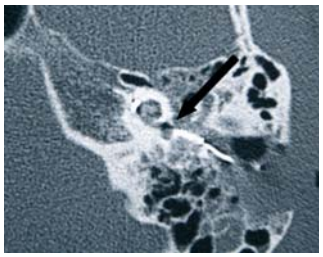

Fig 8. Patient 2; postoperative axial CT scan with partially removed promontory (arrow).

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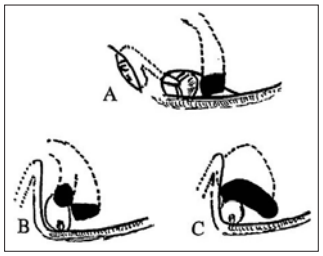

Fig 9. Surgical technique for inserting the cochlear multielectrode array into ears with total neo-ossification (from W. P.R. Gibson, Clark & Cowan International Cochlear Implant, Speech and Hearing Symposium, Annals of Otology, Rhinology and Laryngology, 1995)

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