Usefulness of Reconstructed 3D images for Cochlear Implantation in a Case with a Facial Nerve Anomaly

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Introduction
Inner ear malformations often have associated FN anomalies, and the more severe the degree of the FN anomaly, the more difficult it is to perform CI surgery.

Conclusion
Reconstructed 3D CT images were very useful to identify the site of cochleostomy and perform CI surgery in a case of difficult temporal bone anatomy.

Case report
A 3-year-old male presented with bilateral moderate to profound hearing loss at birth. He had cleft palate and bilateral otitis media with effusion.

He was fitted with bilateral hearing aids and received hearing rehabilitation. However, his hearing level had gradually decreased and his family chose CI surgery on the left (poor hearing) ear at 9 years of age.

Preoperative CT
CT shows very poorly pneumatic mastoid and otitis media with effusion on Lt ear. He has bilateral vestibular hypoplasia and a narrow left Fallopian canals (B,C arrows). He also has a left ossicular chain anomaly, with at least absence of the stapes super-structure.

Operative findings
The stapes superstructure is absent, and the footplate of the stapes is not identified. The stapedial tendon is connected with heads of stapes. There are two FN bundles (FN bifurcation, lines in B), and the anterior FN bundle obscures the promontory and round window. There is a small dip behind the anterior FN bundle that looked like a round window niche (or pseudomembrane).

It was difficult to perform cochleostomy because of the lack of landmarks of the basal turn of the cochlea, and the first surgical attempt at cochleostomy was abandoned.

Reconstructed CT image
A repeat CT scan was performed after the first surgery with reconstructed 3D images of the temporal bone and the cochlea. These images focus on the same view as the previous operative field (A,B). The image of the cochlea has been merged with this 3D image (C,D). The position suitable for cochleostomy (D, round).

Second surgery.
Cochleostomy has been successfully performed at the anterior-inferior part of the FN bundle (A), and the CI electrode is fully inserted in the cochlea (B).

Tip:
High-performance multi-slice CT scanners have made it possible to generate detailed 3D images of temporal bone structures. 3D image of the cochlea are used to plan CI surgery.