

THE NEW MID-SCALA ELECTRODE ARRAY: A RADIOLOGIC AND HISTOLOGIC STUDY IN HUMAN TEMPORAL BONES

Hasepass F, Bulla S, Maier W, Laszig R, Arndt S, Beck R, Traser L, Aschendorff A; *Otology & Neurotology* 2014; 35(8):1415-20

Advanced Bionics introduced the HiFocus™ Mid-Scala electrode (HFMS) in February 2013. Developed through extensive research, the HFMS is designed for mid-scalar placement to protect delicate cochlear structures, and to offer surgical flexibility and ease of use.

KEY TAKE AWAY POINTS

- It is generally agreed that an atraumatic approach that preserves cochlear structures should be used in every cochlear implant (CI) surgery. The HFMS was designed to minimize insertion trauma, to sit within the Scala tympani (ST), and to preserve cochlear structures.
- In this temporal bone study, 19/20 ST insertions were achieved, with consistent insertion depth and placement of the HFMS. There was one scala vestibuli (SV) insertion that occurred because of surgical technique rather than electrode design.
- This study confirms the atraumatic design of the HFMS, as well as its suitability for both cochleostomy (C) and round window (RW) insertions.

OBJECTIVES

This temporal bone study evaluated insertion experience with the HFMS electrode with special attention paid to intracochlear trauma and insertion depth.

METHODS

- The HFMS was inserted in 20 human temporal bones by two experienced surgeons, using conventional mastoidectomy and facial recess approaches.
- Ten RW and 10 C insertions were performed using a free hand off-stylet approach (without tool).
- Healon® lubricant was used in all cases.
- Insertion was stopped when the second electrode marker reached RW or C, or when first resistance was felt.
- Rotational tomography (RT) was performed and the images analyzed independently by a radiologist and an otorhinolaryngologist to classify: cochlear dimension, length of insertion, angle of insertion, and electrode positioning.
- Histomorphologic analysis was performed to determine electrode position and degree of trauma, which then were correlated with radiologic findings.

RESULTS

- Both surgeons reported that insertion and handling of the HFMS were simple and straight-forward.
- Complete insertions were accomplished in 19 bones. One incomplete insertion occurred following a C approach.
- Radiology revealed 19 ST insertions and 1 SV insertion (caused by surgical technique rather than by electrode design). A mediolateral electrode position was observed in one bone.
- Microscopic analysis showed atraumatic insertion in 18/19 ST insertions. One bone, in which a C approach was used, exhibited a lifting of the basilar membrane.
- In all ST insertions, the electrodes were positioned towards the modiolus.

- In 3 cases, the HFMS rested close to and slightly touched the medial wall of the ST.
- There were no signs of pressure, damage to modiolar wall or Rosenthal's canal.

HISTOPATHOLOGIC FINDINGS OF 20 TEMPORAL BONES

Grade	Histopathologic changes	No. of TB (n)
0	No trauma	18
1	Elevation of basilar membrane	1
2	Rupture of basilar membrane or spiral ligament	0
3	Dislocation into scala vestibuli	0
4	Fracture of osseus spiral lamina or modiolar wall	0
Other	Primarily scala vestibuli insertion	1

* Grading according to Eshraghi et al.

Table 1. Histopathologic findings of 20 temporal bones. Atraumaticity was observed in 18/19 ST insertions.

- In cases where a complete insertion was accomplished, the mean insertion length was 19.1 mm (19.2 mm for RW insertions, 18.9 mm for C insertions).
- Insertion angles for complete insertions varied between 342 and 487°, with a mean value of 406.8° (398° for RW insertions, 414° for C insertions), with a range of 342-487°.
- Although slightly more trauma was associated with the C approach, the HFMS enabled the surgeons to successfully select either a RW or C approach depending upon the anatomy encountered during insertion.
- Implantation of the HFMS in the clinic's first 15 human subjects showed comparable RT results with no dislocations.

CONCLUSIONS

The HFMS provides an atraumatic design that can be inserted either via C or RW approach.