

## COMPARISON AND ALTERNATE DESIGNS FOR PERI-MODIOLAR ELECTRODE ARRAYS: INSERTION TRAUMA AND POSITION

*R.K. Shepherd, C.G. Treaba, B.C. Pyman and G.M. Clark*  
Dept. of Otolaryngology, The University of Melbourne, Melbourne, Australia

While it has been shown that the straight but flexible banded electrode array can be safely inserted into the scala tympani of the human cochlea, histological studies have revealed that the array lies along the outer wall<sup>1,2</sup>. Since a profound total hearing loss is generally associated with a moderate to complete degeneration of the spiral ganglion peripheral process<sup>3</sup>, these electrodes lie some distance from their target neural population - the spiral ganglion soma - located within Rosenthal's canal. Electrophysiological results have shown that moving the electrode array from the outer wall to a site close to the modiolus results in a significant reduction in threshold and an increase in dynamic range<sup>4</sup>. These findings imply that peri-modiolar electrodes will produce more localised neural excitation patterns, resulting in an increase in the number of discriminable electrodes, and leading to further improvements in speech perception. In the present human temporal bone study we have been evaluating electrode insertion trauma and electrode position within the scala tympani for up to five peri-modiolar electrode designs. Three arrays of each design have been evaluated. Each array was inserted into the scala tympani of a fixed human temporal bone which had been prepared as it would for cochlear implant surgery. The electrodes, which were inserted by the one surgeon with considerable clinical experience, were fixed close to the cochleostomy. The temporal bones were x-rayed to accurately determine insertion depth and the location of

individual electrodes<sup>5</sup>. Finally, the cochleas were embedded in plastic, 300  $\mu\text{m}$  thick sections were cut with the electrode array *in situ*, and each section photographed to scale. Using image analysis techniques, the projection of the electrode array within the cochlea was determined. Evidence of insertion trauma - in particular to the basilar membrane or osseous spiral lamina - was documented for the complete cochlear spiral. Finally, the position of the electrode array relative to the modiolus was measured for each electrode design. The results will be discussed in light of the potential clinical significance of each design.

<sup>1</sup>Shepherd, R. K., Clark, G. M., Pyman, B. C. & Webb, R. L. (1985) *Ann Otol Rhinol Laryngol* 94: 55-59.

<sup>2</sup>Kennedy, D.W. (1987) *Laryngoscope* 97: 42-49.

<sup>3</sup>Nadol, J. B. (1990) *Hearing Research* 49: 141-154.

<sup>4</sup>Shepherd, R. K., Hatsushika, S. & Clark, G.M. (1993) *Hearing Research* 66: 108-120.

<sup>5</sup>Marsh, M.A., Xu, J., Blarney, P.J. et al., *Am J Otol* 14: 386-391.



Minerva Access is the Institutional Repository of The University of Melbourne

**Author/s:**

Shepherd, R. K.; Treaba, C. G.; Pyman, B. C.; Clark, Graeme M.

**Title:**

Comparison and alternate designs for peri-modiolar electrode arrays: insertion trauma and position [Abstract]

**Date:**

1997

**Citation:**

Shepherd, R. K., Treaba, C. G., Pyman, B. C., & Clark, G. M. (1997). Comparison and alternate designs for peri-modiolar electrode arrays: insertion trauma and position [Abstract]. In Abstract book IFOS Sydney '97.

**Persistent Link:**

<http://hdl.handle.net/11343/27010>

**File Description:**

Comparison and alternate designs for peri-modiolar electrode arrays: insertion trauma and position [Abstract]