



Moderator's Introduction

Intricacies of Cochlear Implant Electrode Design and Their Limitations

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The Journal of International Advanced Otology received an unsolicited, and thought provoking article from an employee of Med El Corporation, which initially declared no conflict of interest (this was later corrected). The title of the article "Why pre-curved modiolus hugging electrodes only cover the basal turn of the cochlea and not beyond that?" appeared to be asking a question, but on closer scrutiny the author appeared to know precisely the answer to that question. It was his premise that manufacturing of a pre-curved modiolus-hugging (MH) electrode with a curvature beyond one full turn or 360° is not practically possible utilizing existing technology and materials. This technical limitation in his view was depriving patients of coverage of the entire population of spiral ganglion cells, which encompasses 1 3/4 turn. He also cited electrode tip fold over, electrode scalar deviation, and inconsistent electrode-modiolus wall distance, as being inherent disadvantages of the modiolus-hugging design. The article seemed to imply that lateral wall (LW) electrodes therefore had inherent advantages over MH electrodes.

Since the author mentioned competing companies by name (Cochlear Corporation and Advanced Bionics), it was felt that all companies ought to be given the opportunity to respond. In this manner an interested reader, and the cochlear implant surgeons in particular could gain insight into the subtle nuances of electrode design, and the manufacturing philosophies of the different companies. We therefore solicited among others, articles from Cochlear Corporation, Advanced Bionics and Nurotron Corp. This was done without revealing the specific contents of the Med El article and was agreed to by its author. We asked the companies to specifically address the following with regards to Modiolus Hugging (MH) vs. Lateral Wall (LW) electrodes:

1. Do limitations in manufacturing technology compel cochlear implant companies to design MH electrodes, which cannot cover more than 360 degrees?
2. Are LW electrodes truly less traumatic to the cochlear structures?
3. How long should an electrode be and why?
4. Which electrode should be selected for a given clinical situation and why?
5. Does MH electrodes truly reduce power requirements?
6. Does tip fold over occur in straight electrodes or is it a feature solely of MH electrodes alone.
7. Is electrode scalar deviation unique to any particular electrode design?

The questions were answered to various degrees by the different companies; with some authors being more detailed and nuanced than others. All articles went through the peer review process. It is not the goal of this editor or the journal to place their thumbs on the scales or stand in judgment of the seemingly controversial and sometimes opposing views. Such views can co-exist in biological systems which by their very nature can be imperfect. It is also not the mission of this journal to publish an article from one manufacturer alone, without giving the opportunity for other manufacturers to respond. One thing is certain however that despite their sometimes strongly held views (which at times can appear contradictory) cochlear implants of all companies are incredibly stable, and safe, and deliver tremendous benefits to their recipients. I encourage the reader to read all articles to make educated choices with regard to what is best for their own patients and in their own surgical situations. While the state of perfection in electrode design may be elusive (as manifested by multiple designs) all companies have taken great efforts to improve on electrodes making them less traumatic and safer for our patients.

I would like to personally thank Anandhan Dhanasingh of MED-EL GmbH for setting up the scene, and for Frank Risi from Cochlear Limited for his erudite and detailed article on electrode design, past present and future. Thanks are also due to Fan-Gang Zeng along with his co-authors Stephen Rebscher, David Daomin Zhou of Nurotron Biotechnology Inc. and Mark Downing of Advanced Bionics LLC, for their willingness to contribute to *The Journal of International Advanced Otology*.

Arun K. Gadre
Associate Editor
Department of Otology & Neurotology, Geisinger Medical Center, Danville, USA

Corresponding Address: Arun K. Gadre E-mail: arungadre@yahoo.com

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