

FOR PROFESSIONALS



Cochlear[®]
Hear now. And always



Inspired by
a lifetime of hearing
performance

Delivering optimal hearing outcomes for your patients

To help your patients achieve optimal hearing outcomes, our implants and electrodes are designed to deliver benefits over the long term.

There are several factors that can contribute to a patient's lifetime of hearing performance, collectively referred to as the evidence based performance stack (Figure 1).¹⁻⁹ The performance stack highlights that even though individually each factor may be important, the benefits are additive and only enabled by delivering the previous factors.

The four factors in the centre of the stack have an impact on cochlea health, and the benefits of the top three factors can only be delivered by Cochlear.

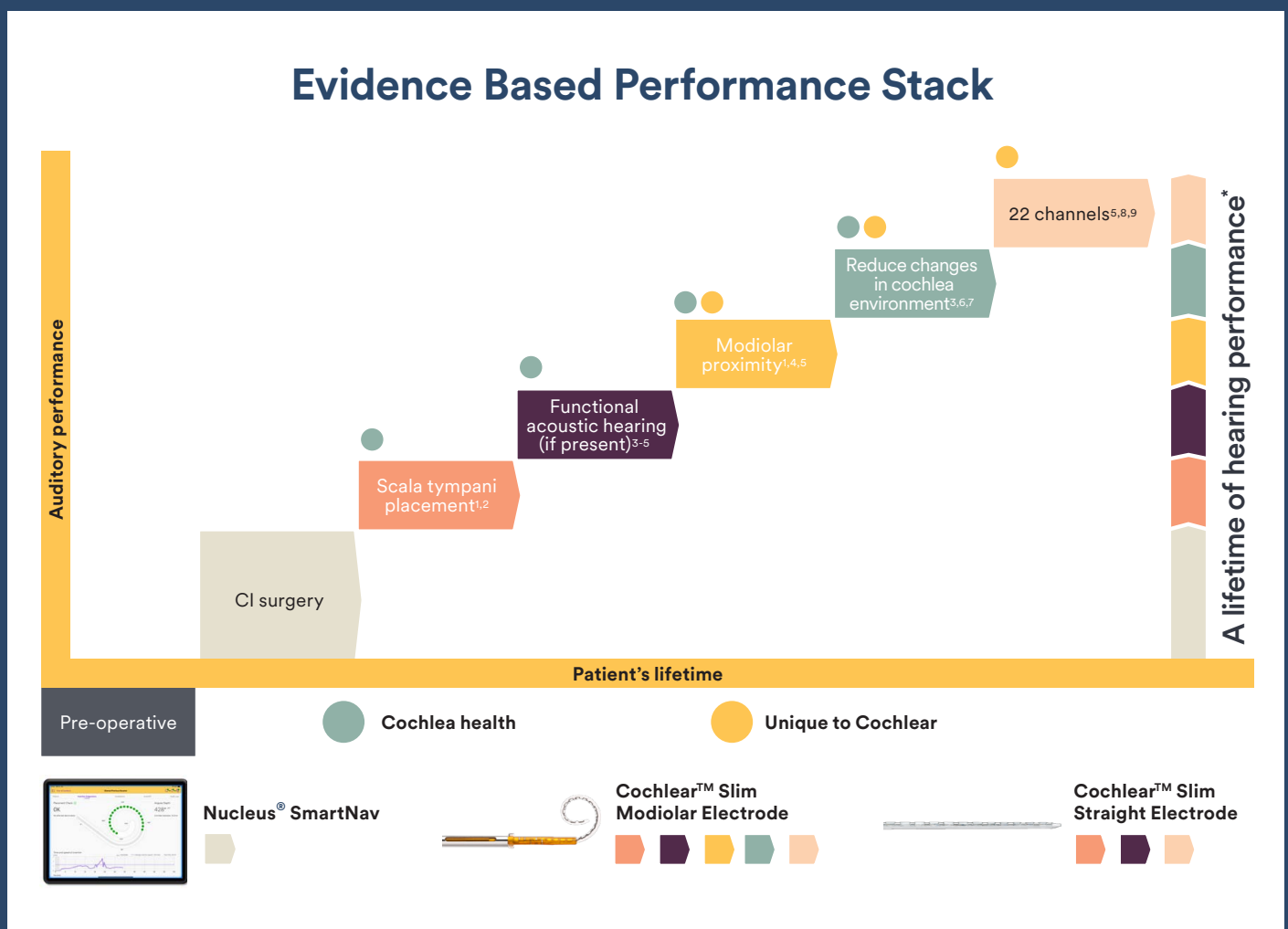


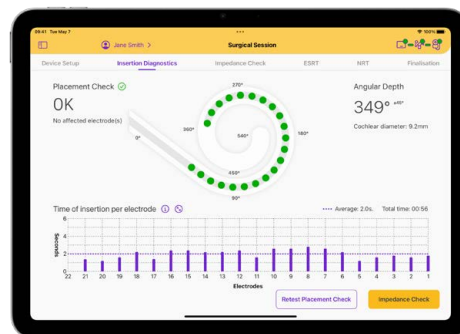
Figure 1: The performance stack highlights factors that can contribute to your patient's lifetime of hearing performance.

The Nucleus® SmartNav system

The Nucleus® SmartNav System provides wireless, real-time, actionable insights to support navigation during cochlear implant surgery. It delivers added assurance to you and your patients that the electrode was placed as intended.¹⁰ Features include:



Placement check – provides valuable information on final electrode placement and is designed to reduce the need for intraoperative imaging.¹⁰



Angular insertion depth – provides real-time measurement of angular insertion depth and final electrode position.^{*,11,12}



Time of insertion – provides feedback on consistency of the electrode insertion.¹³⁻¹⁵



Impedance – provides assurance that the device is operating as intended, prior to leaving the operating room.¹⁶



Advanced and AutoNRT® measurements – the option to use Advanced NRT for obtaining neural response telemetry thresholds, providing flexibility in settings for optimal measurement.^{17,18}



Electrical Stapedius Reflex Threshold (ESRT) – confirms nerve response to electrical stimulation.¹⁹

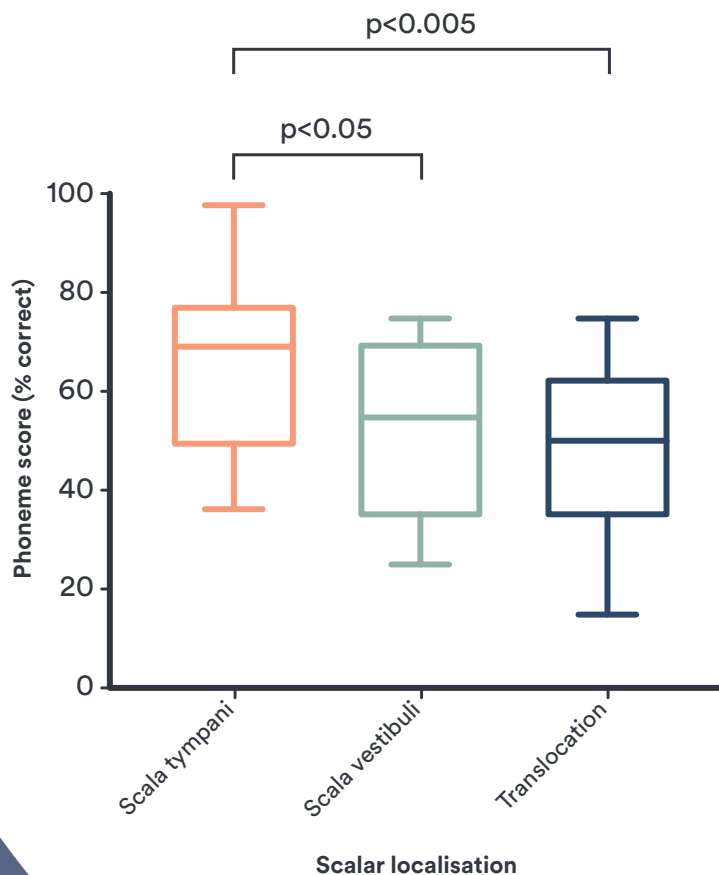
* The angular insertion depth function is disabled when the Nucleus SmartNav System is used with a perimodiolar electrode.

Scala Tympani placement improves outcomes²

Studies have shown a positive correlation between the placement of the cochlear implant electrodes fully in the scala tympani, modiolar proximity and improved hearing performance outcomes.^{1,2}

In a multicentre study in the United States (n=44), 100% of Slim Modiolar electrodes were placed successfully in the scala tympani. The thinness of the Slim Modiolar electrode and its soft, flexible sheath allows surgeons to utilise the round window insertion method which has been shown to support correct scala placement.²⁰

Twelve-month post-implantation phonemes scores of post-lingual patients according to scalar localisation.²



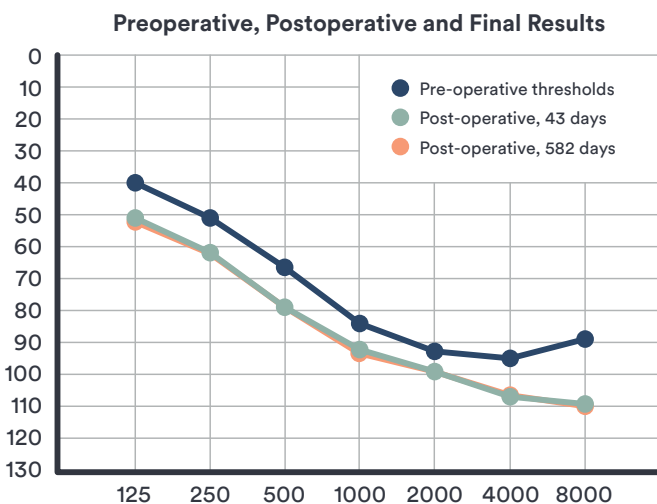
Shaul et al., 2018 showed that speech perception scores for post-lingual recipients were higher in the scala tympani group (69.1%) compared with the scala vestibuli group (54.2%) and translocation group (50%).²

Functional Residual Hearing Preservation with Slim Modiolar

With a cochlear implant, preserved residual hearing can be functionally relevant in the short and long term. Hence the aim should be to preserve functional residual hearing when possible for those with significant levels of low frequency hearing (Unaided LFPTA* of <60 dB HL preop).^{3,4}

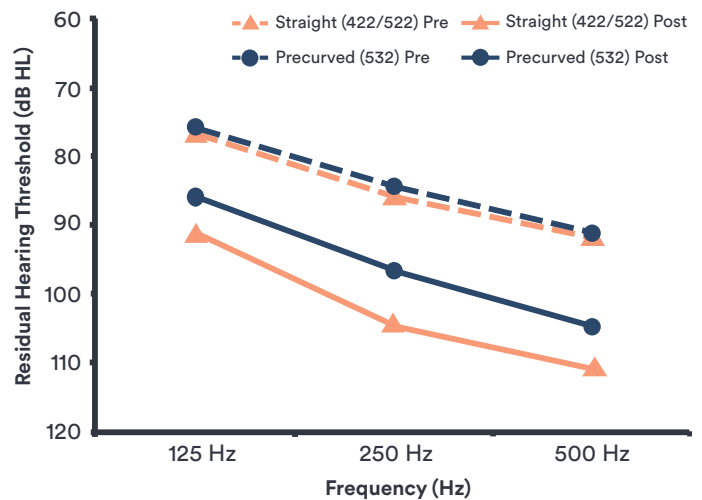
Iso-Mustajarvi et al., 2019²¹, Holder et al., 2019²², Woodson et al., 2021²³ and Ramos et al., 2017²⁴ have all found that the Slim Modiolar array allows for preservation of thresholds in populations with low frequency residual hearing. The electrode has additional benefits in electric-only stimulation if patients do lose residual hearing over time.²⁵

Preoperative, postoperative and final mean hearing thresholds²¹



Iso-Mustajarvi et al., 2019²¹ showed an 11 dB threshold shift after 582 days using the Slim Modiolar electrode²¹

Preoperative and postoperative thresholds²²



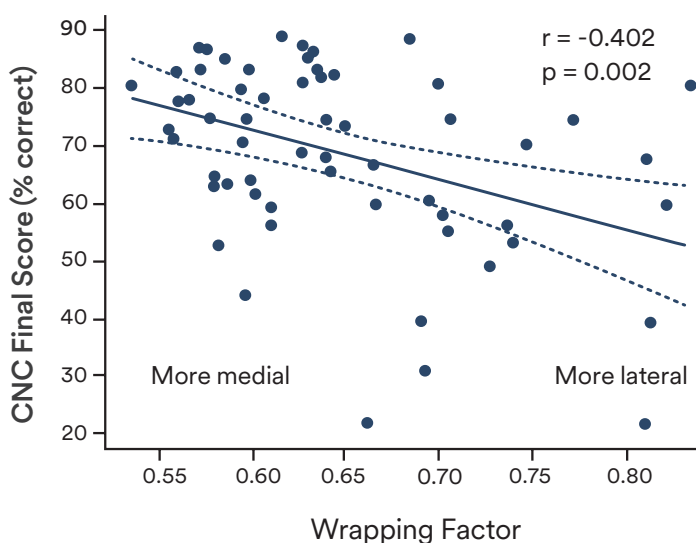
Holder et al., 2019²² demonstrated a significantly ($p=0.028$) better hearing preservation for the Slim Modiolar group at 6-mths post-op when compared with Slim Straight²²

Modiolar proximity may improve speech perception¹

Modiolar proximity is an important contributor to effective electrical stimulation.^{1,24,26} Placement of the electrode close to the modiolar wall may provide more focused stimulation^{28,39} and thus support improved speech understanding.²²

- Holden et al., 2013¹ looked at 59 subjects with electrodes confirmed in scala tympani. Subjects were implanted with devices from two manufacturers.
- The study compared the wrapping factor of the electrode with CNC word score. The wrapping factor shows how closely or loosely wrapped an electrode array is relative to the modiolar wall.

A scatter plot of wrapping factor versus CNC final score¹



Holden et al., 2013¹ showed that electrodes with close proximity to the modiolar wall provide benefits in terms of spatial selectivity and improved speech perception outcomes compared to arrays further away from the modiolar.

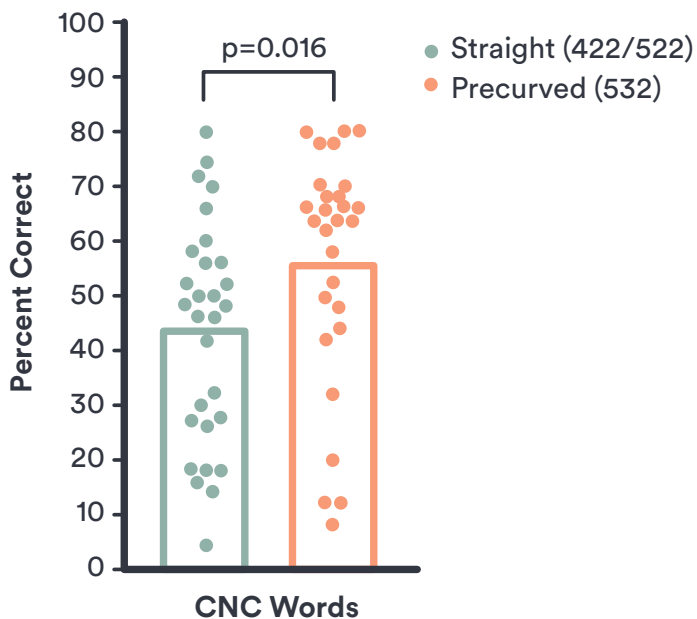
Only Cochlear offers the Slim Modiolar electrode which sits close to the modiolar wall to permit more precise and effective stimulation of the spiral ganglion.

Slim Modiolar may improve speech perception²²

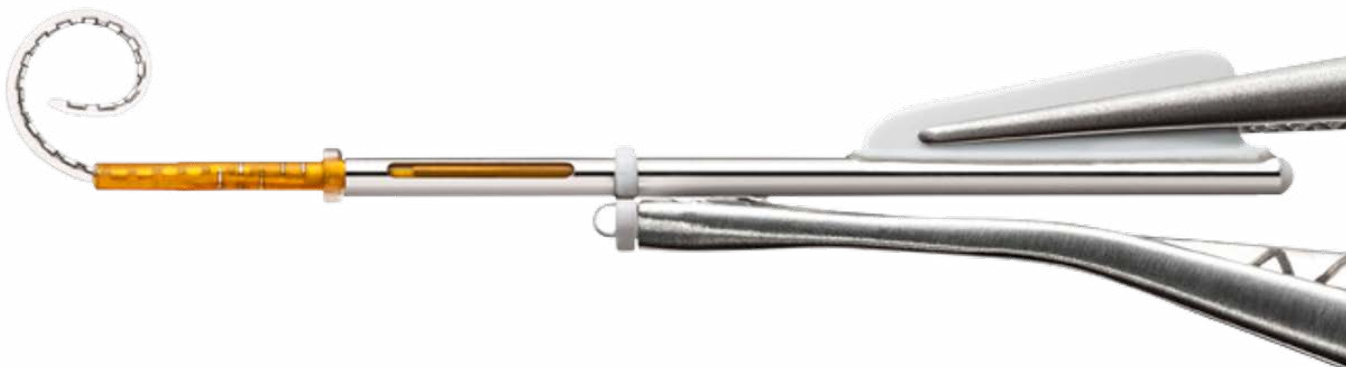
Holder et al²² published a study in 2019 that matched patients for the pre-op factors that impact outcomes, allowing a better comparison of the results of each electrode.

This study evaluated two groups (n=29 each) matched for age, preoperative low frequency pure tone average (LFPTA), preoperative Consonant-Nucleus-Consonant (CNC) scores, and daily processor usage.

Patient speech recognition outcomes at 6 months after implantation for two groups of patients – with either a straight or precurved electrode, Holder et al 2019²²



The precurved electrode group's mean CNC score was found to be significantly higher ($p=0.016$) than for the group with a straight array.²²



Slim Modiolar could preserve cochlea health^{20,24,40-43}

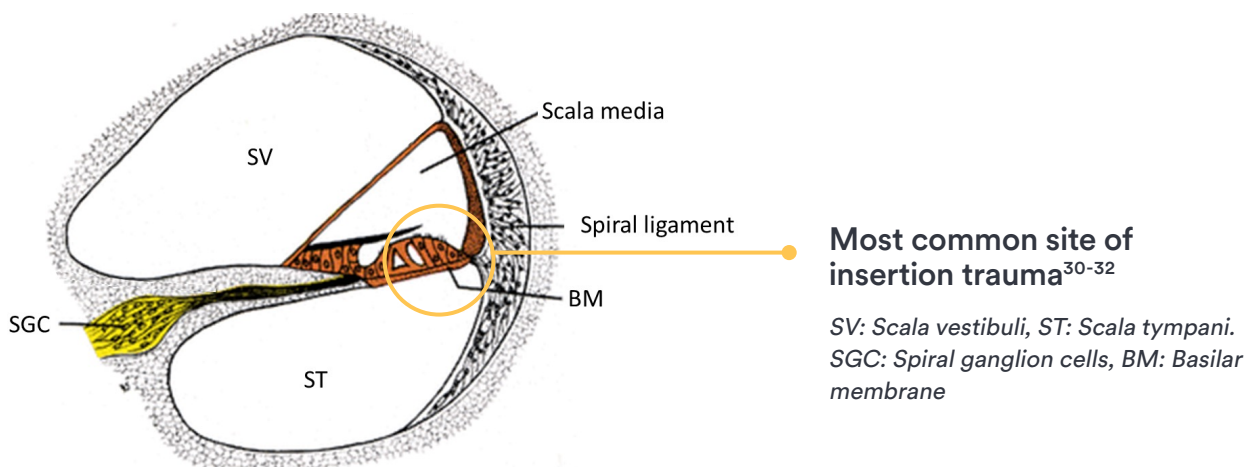
Placement of the electrode close to the modiolar wall also reduces both acute and long-term trauma to the structures of the lateral wall, further supporting ongoing hearing outcomes.^{4,5,27,44}

Early and late changes to the intra-cochlea environment driven by inflammatory and fibrotic processes due to electrode insertion are inevitable.⁵

However there are several factors that can help reduce the level and severity of these changes over time:^{1-7,16-18,28,29}

Avoid contact with, and trauma to lateral wall structures

- The most common site of insertion trauma is to the structures of the lateral wall, including the basilar membrane and spiral ligament.³⁰⁻³²



- Positioning an electrode away from the lateral wall could potentially avoid injuring the rich blood supply to the wall. This could prevent intracochlear bleeding and inflammation.
- When positioned laterally, the fibrotic tissue encapsulating the electrode can impede the function of the basilar membrane.²⁷

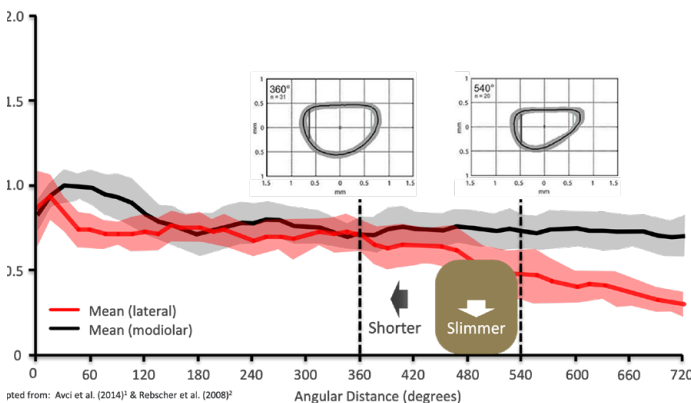
Avoid overly deep electrode insertions

A large cohort study (484 ears) shows that increasing angular insertion depth significantly reduced postoperative speech perception for monosyllables.³⁴

There is also evidence that the risk of translocation injury may increase with deeper lateral wall insertions.³⁵

Avci et al., 2017³⁰ and Rebscher et al., 2008⁴³ have shown that the height of the lateral aspect of scala tympani beyond 360 degrees gradually reduces. In comparison, the height of the medial aspect of scala tympani remains consistent along the entire length.

Modiolar and lateral wall height vs angular distance



With the reducing lateral wall height, the diameter and length of the electrode becomes an increasingly important consideration for minimising trauma.³⁰

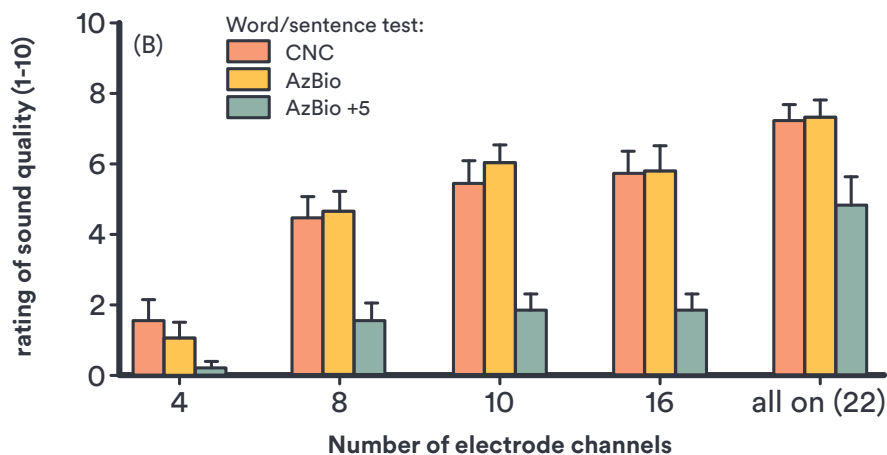
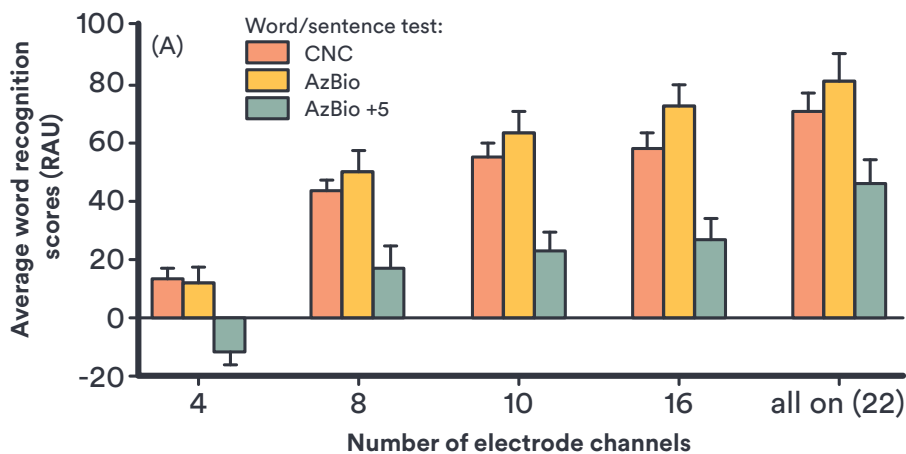
Due to its position close to the modiolum, the Slim Modiolar electrode does not need to be inserted deeper into the cochlea, as compared to a lateral wall electrode, to achieve the same level of spiral ganglion coverage.³⁶ A ~90% coverage of SGNs would necessitate a modiolar wall length of about 16 mm.³⁶

Focused Stimulation Through 22 Independent Channels

Evidence supports the potential for more favourable hearing outcomes, particularly with speech in noise, with a larger number of independent channels.⁹

Only Cochlear offers electrodes with 22 independent channels, which may support improved speech recognition outcomes, particularly in noise.⁸ Only the Slim Modiolar electrode provides the unique combination of consistent placement in the scala tympani, placing all 22 channels in close proximity to the modiolus, to deliver improved hearing performance.^{20,37,38}

Graphs showing speech test results with differing numbers of stimulating electrodes, Berg et al.⁸



N=11; perimodiolar electrodes (Contour Advance or Slim Modiolar), all electrodes in scala tympani; stimulation with n=m or 16-of-22

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Hear now. And always

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We aim to give people the best lifelong hearing experience and access to next generation technologies. We collaborate with leading clinical, research and support networks to advance hearing science and improve care.

That's why more people choose Cochlear than any other hearing implant company.

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