Hearing preservation with standard length electrodes in paediatric cochlear implantation


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INTRODUCTION
Preserving low frequencies following cochlear implantation improves outcomes and allows patients to utilise a combination of electrical and acoustic stimulation. This importance has been reflected in advances in electrode design and refined surgical techniques.

Full insertion of standard length electrodes may be advantageous over shortened electrodes because more electrodes can be activated over time if low frequency hearing loss progresses. Surgeons must counsel patients over this choice but data is lacking regarding the degree and likelihood of hearing preservation achievable with standard length electrodes in children.

We report our experience using standard length cochlear implant arrays for hearing preservation in children.

METHODS
Retrospective case series. Inclusion criteria: pre-operative hearing ≤50dB HL at 250Hz and aged ≤18 years. Hearing preservation percentages calculated using the HEARRING group formula.

\[ S = \left[ 1 - \frac{\text{PTApot} - \text{PTAp} \text{r}}{\text{PTAmax} - \text{PTAp} \text{r}} \right] \times 100 \% \]

Preservation of > 75% was considered complete, 25-75% partial, and 1-25% minimal. Patients were implanted with either MED-EL FLEX28 or Cochlear Nucleus CI522. Standardised operative technique with facial recess approach, posterior tympanotomy and minimally traumatic round window insertion.

Study population & hearing preservation rates

RESULTS
52 implantations in 27 paediatric patients met inclusion criteria. Mean age at implantation: 9.8 years. Average latest audiogram: 8 months. Mean total pre- and post-operative pure tone averages were 82.8dB and 92.6dB.

17(33%) ears demonstrated complete hearing preservation, 22(42%) ears partial hearing preservation, 7(13%) minimal hearing preservation, and 6(12%) exhibited no acoustic hearing post-operatively. Mean hearing preservation was 55.5%.

There was no evidence that any individual factors, or combination of factors, affected hearing preservation. Variables assessed included patient age (p=0.40), patient gender (p=0.61), aetiology of hearing loss (Pendred syndrome specifically) (p=0.32), electrode type (p=0.27), insertion depth (p=0.87), laterality (p=0.59), pre-operative hearing level (p=0.41), and even time between surgery and hearing testing (p=0.69). Factors assessed in combination included electrode type and insertion depth (p=0.70), age and time to hearing testing (p=0.77), and aetiology and electrode type (p=0.31).

CONCLUSION
This study shows that hearing preservation is achievable in paediatric cochlear implantation with standard length electrodes. The degree of preservation varies between individual implantations and the reasons for this are yet to be fully understood.

Our results showed rates of complete preservation 33%, partial preservation 42%, minimal preservation 13% and loss of hearing in 12% implantations. These figures can be used to counsel patients and parents pre-operatively.

The use of standard length electrodes is advantageous in allowing for the option of full electrical stimulation if hearing is not preserved or subsequently deteriorates.