Current evidence for Implantation under 12 months:
Australian experience

Robert Briggs\textsuperscript{1,2,3}  Shani Dettman\textsuperscript{1,2,3}
Jaime Leigh\textsuperscript{1,3}  Gabriella Constantinescu\textsuperscript{4,5}
Monique Waite\textsuperscript{4}  Dimity Dornan\textsuperscript{4,5}
Yetta Abrahams\textsuperscript{6}  Aleisha Davis\textsuperscript{6,7}
Richard Dowell\textsuperscript{1,2,3}
Disclosures

Dr Briggs is a consultant for Cochlear Ltd

The University of Melbourne receives research funding from Cochlear Ltd
Cochlear Implant programs

Early Intervention centres and University research collaboration
Overview

Number of children CI < 12mo

Outcomes
• Language
• Speech production
• Speech perception

Surgical perspectives

Conclusions
Decreasing age at implant over time, N=777
14 years of implanting under 12 months of age N = 92

- 27 (29%) unilateral,
- 26 (28%) simultaneous bilateral,
- 34 (37%) seq bilateral, (and 5 not stated in database)

Average age at implant

- First CI 0.86 years,
- Second 1.76 years

Candidacy Guidelines

- 3 frequency PTA of poorer than 80 dB in ear to be implanted
- and poorer than 70dBHL in contralateral ear

10 years of implanting under 12 months of age N = 76

- 97% diagnosed through Universal Newborn Hearing Screening
- 47 (61%) sim bilateral

**Average age at implant**
- bilateral 0.58 years
- CI1 0.58 years
- CI2 0.83 years

**Candidacy Guidelines**
Audiological status confirmed at 70dBHL or poorer (Ching et al) OR demonstrated poor functional access
CI under 12 months QLD experience

12 years of implanting under 12 months of age N = 52

- 31 (59.6%) simultaneous bilateral
- 13 (25%) sequential bilateral
- 8 (15.4%) unilateral

**Average age at implant**

- bilateral 0.70 years
- seq bil CI1 0.69 years
- seq bil CI2 2.9 (range 0.83 to 7.41 years )

**Candidacy Guidelines** Each ear is assessed individually

Severe to profound, steeply sloping OR poor functional access (e.g. ANSD)
An inability to detect /s/ at 1metre in quiet and best aided condition
Absence of aided cortical evoked potential responses
Language Outcomes
Language Outcomes- VIC
(RI-TLS mean receptive language growth:

CI ≤ 12 mo = 0.90
CI 13-24 mo = 0.92

Significant difference in delay but no significant difference in rate of growth
p = 0.830
t-value = -0.21

Language Outcomes- VIC
(PPVT receptive language standard scores 3 yrs post CI)


* p=0.033, t-value = 2.23
Language Outcomes- VIC
(PPVT standard scores at school entry)

Language Outcomes- NSW/ACT
(PPVT standard scores at 3 years of age: n=15, CI <12 months)
Language Outcomes- NSW/ACT
(PLS-4 standard scores over time from CI to school entry: n=15, CI <12 mo)
CI under 12 months QLD experience

- **Hear and Say Baby Research Study**
  
  26 children with 3 year data
  9 children in this group using CI(s)

**Inclusion criteria**

- Permanent bilateral HL identified thru UNHS
- Optimal amplification before 12 months
- Enrolled in AVT before 12 months
- No known physical/cognitive difficulties
- Spoken English in the home

**Materials**

- Preschool Language Scale - 4 (PLS-4)
- Tested six monthly
Language Outcomes – QLD
(PLS-4 Total Language standard scores overtime: n= 9, CI <12 mo)
Model of Language vs age at switch on

Delay from 6mth to 12mth is predictive of a decrease of 0.7SD in score.
A further 6mth delay predicts a further decrease of 0.37SD, and a further 6 month delay (to 2yrs) predicts a further decrease of 0.25SD in mean scores.

Global language score : 114 CI children at 5 years
Speech Production Outcomes
Speech production outcomes – VICTORIA
(DEAP % correct: n=31 had CI <14 mo compared to other age groups at implant)

All children completing DEAP at school age n=92
Divided into 3 equal groups
• CI 6 mo to 14 mo (n=31, group 1)
• CI 15 to 20 months (n=31, group 2)
• CI 21 months to 5 years (n=30, group 3)

differences were significant at the p<0.05 level
Speech production outcomes - NSW
(GFTA-2: Most recent test results: n=15, CI <12 mo)

Child participants
Speech Perception Outcomes
All children completed speech perception testing N= 249 OSW, N=220 OSS
Divided into 5 groups
- CI under 12 mo (red)
- CI 13 to 18 mo (blue)
- CI 19 to 24 mo (blue)
- CI 25 mo to 3 ½ yrs (green)
- CI 3 ½ yrs to 18 yrs (orange)

Differences were significant at the p<0.001 level
Surgical Experience
Surgical aspects

No Surgical complications attributable to younger age
• Small mastoid, increased diploic bone
• Specialized anaesthesia

Otitis media with effusion – increased prevalence < 12 months
• Should not delay implantation unduly
• ? Lower rate of simultaneous bilateral CI
What have we learned?

Difficulties in assessing very young children

1. You have to wait a long time to see results on standardised tests
2. Combination of delay & trajectories

3. Enormous number of factors affecting the child during his/her development
   - **Family** - participation, maternal education, degree of socio-economic advantage/disadvantage
   - **Communication mode** - choices and shifts over time
   - **Hearing** - choice of device, daily use, unilateral/bilateral, cochleae anatomical variation, number of channels
   - **Child** - temperament, IQ

Younger age at Implantation = Better Speech and Language
Conclusions

Children receiving CI(s) under 12 months (with optimum input and no additional disability) can demonstrate language and speech production outcomes within the same range as their normal hearing peers.
Acknowledgements

For further information please contact

rjsb@unimelb.edu.au
dettmans@unimelb.edu.au