Limits and benefits of hearing preservation

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Quality of CI surgery?

Basically:
• rate of complications
• ability to perform insertions into cochlea

Refined:
• with regard to insertion?
  • Rate of scala tympani insertions
• with regard to electrode?
  • Rate of dislocations of any electrode type
  • Typical trauma pattern?
• with regard to the surgeon?
  • Rate of scala tympani insertions, or dislocations
• with regard to outcome?
  • Rehabilitation results in a specific population
  • Preservation of residual hearing
Comparison of histology and DVT in TB
(Aschendorff et al. 2007 ff, Hassepass et al. 2014)

Example: Contour electrode

Example: MidScala electrode
Comparison of histology and DVT in TB

Example: MedEl electrodes

Standard
Dislocation to SV in 2nd turn

FlexSoft
Dislocation to SV in 2nd turn

Flex EAS
ST insertion
Ongoing Quality Study Freiburg

• initially: RT/Cone-Beam-CT in TB studies
• postop. routine in all adult CI patients
• today: all electrode types, all manufacturers
• insertion via cochleostomy approach or round window
Scala tympani rates of 3 experienced surgeons following cochleostomy
+/- dislocation, individual differences, significant learning curves, n=147
(Aschendorff et al. 2011)
Electrode position II, Scala vestibuli rates

Aschendorff et al. 2011: individual learning curves! + improvement over time, x=trainer effect (1 trained 2, 4, 7 and 8)
Correlation with rehabilitation results?
Freiburg monosyllables (70dB) (OlSa: positive trend for ST, ceiling effect)

At 12 months:
- N = 184
- N = 28
- N = 50
- N = 4

At 24 months:
- N = 116
- N = 23
- N = 37
- N = 2

% correct

Electrode position

- T
- V
- T +
- V +

Significant advantage of scala tympani insertions
- Conservation of basal turn most important
Hearing loss: MedEL Flex 28
N=39, 14 cochleostomy, 25 round window, no sig. difference in preop-thresholds

- Probability of hearing conservation ~65%
- No sig. difference in regards to insertion approach
Hearing loss: AB Midscala

N=20, 9 cochleostomy, 11 round window, no sig. difference in preop-thresholds

- Probability of hearing conservation ~75%
- No sig. difference in regards to insertion approach
Hearing loss: Cochlear Contour Advance

N=25, 25 cochleostomy, no round window

- Probability of hearing conservation ~60%
Hearing loss: Cochlear slim straight (CI422/CI522)

N=60, 24 cochleostomy, 36 round window, no sig. difference in preop-thresholds

- Probability of hearing conservation ~85%
- Rate of preservation increased significantly by round window insertion
Hearing loss: Overall (all arrays)

N=145, 72 cochleostomy, 73 round window, no sig. difference in preop-thresholds

- Probability of hearing conservation ~75%
- Rate of preservation increased significantly by round window insertion
Conclusions: Limits and benefits of hearing preservation

- Preservation of residual hearing is influenced by several factors
  - Electrode design
  - Anatomy
  - Access
  - The human factor → The surgeon
  - Individual vulnerability of the cochlea? Immunological effects?
- All electrodes: 75% preservation of residual hearing, (range 60-85%)
- Best results with thin electrodes, advantage of round window insertion
- Use of residual hearing:
  - Difference in measurable and functional hearing
  - Majority of patients use CI only in the long-term