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Limits and benefits of hearing preservation

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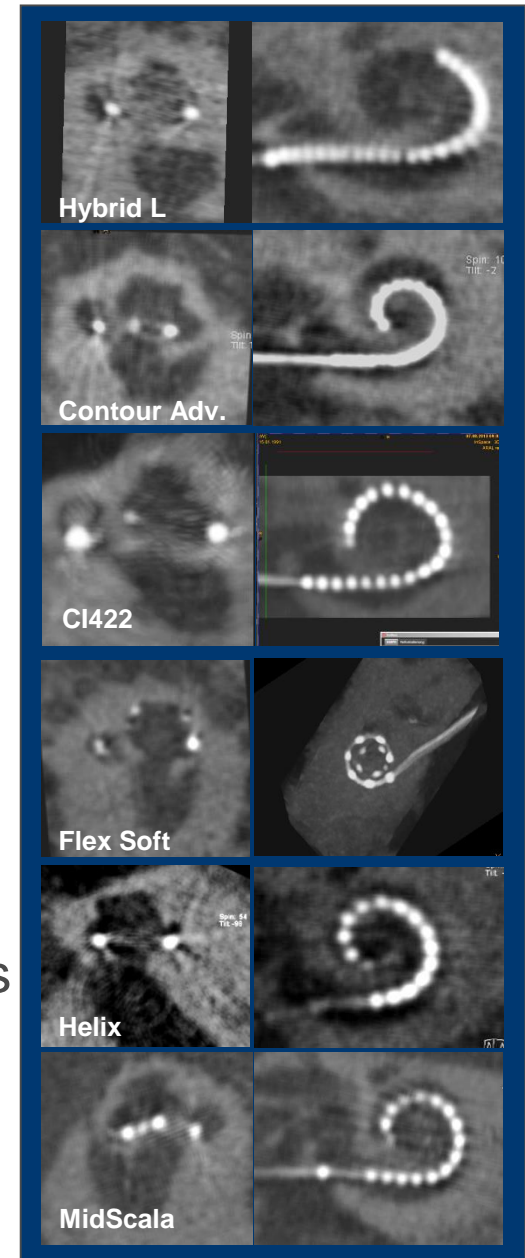
Quality of CI surgery?

Basically:

- rate of complications
- ability to perform insertions into cochlea

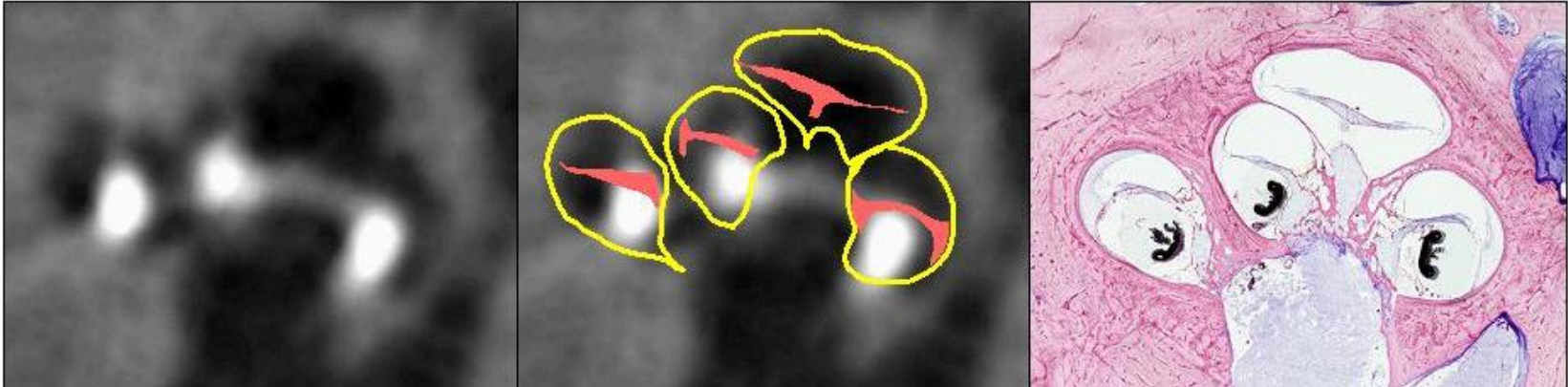
Refined:

- 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



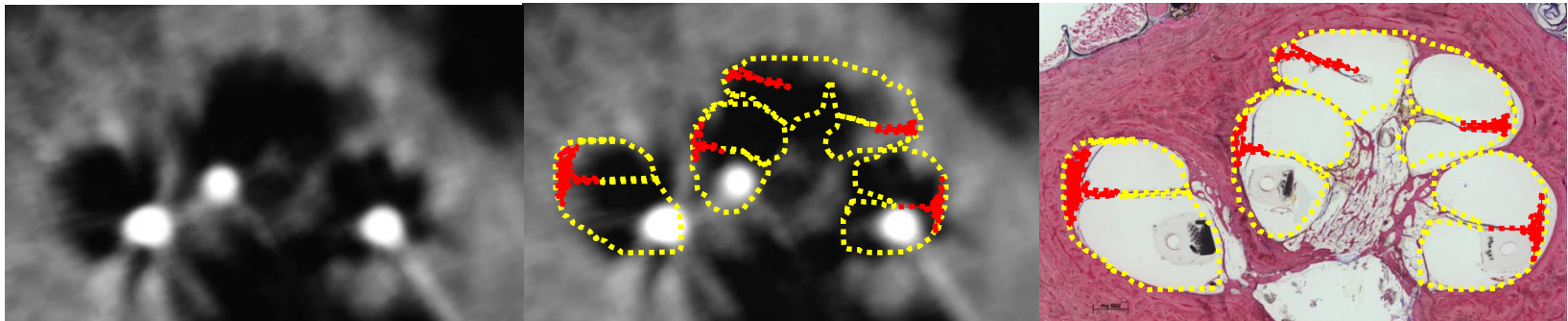
Comparison of histology and DVT in TB

(Aschendorff et al. 2007 ff, Hassepass et al. 2014)



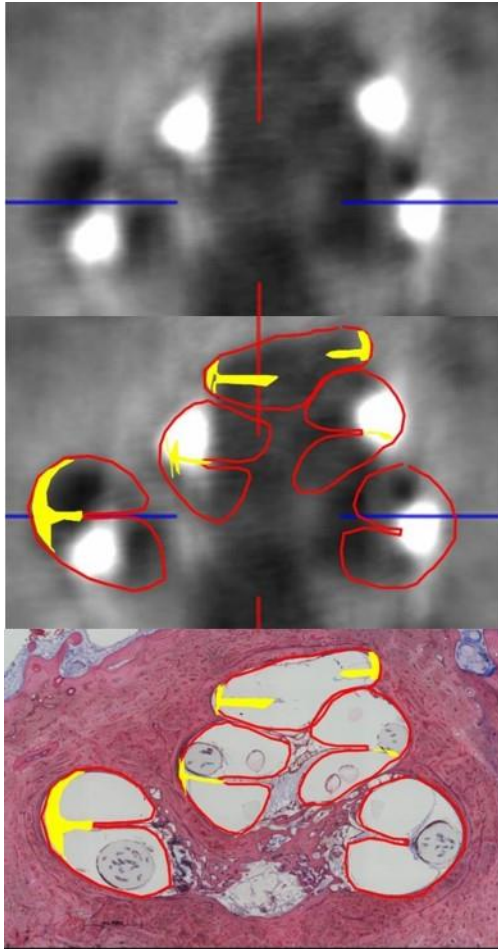
Example: Contour electrode

Example: MidScala electrode



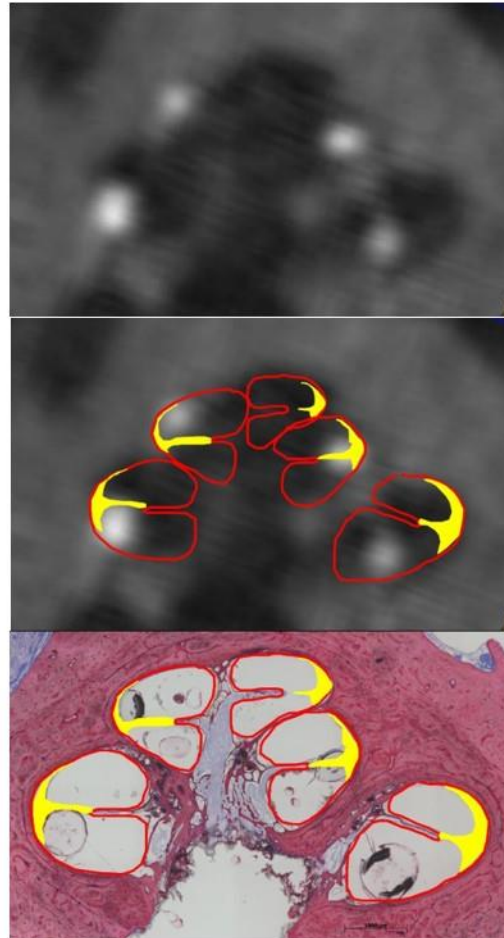
Comparison of histology and DVT in TB

Example: MedEl electrodes



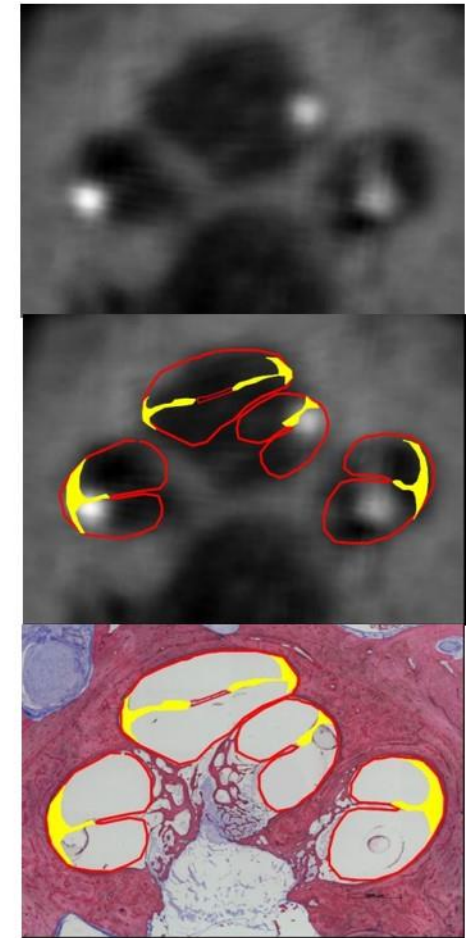
Standard

Dislocation to SV in 2nd turn



FlexSoft

Dislocation to SV in 2nd turn

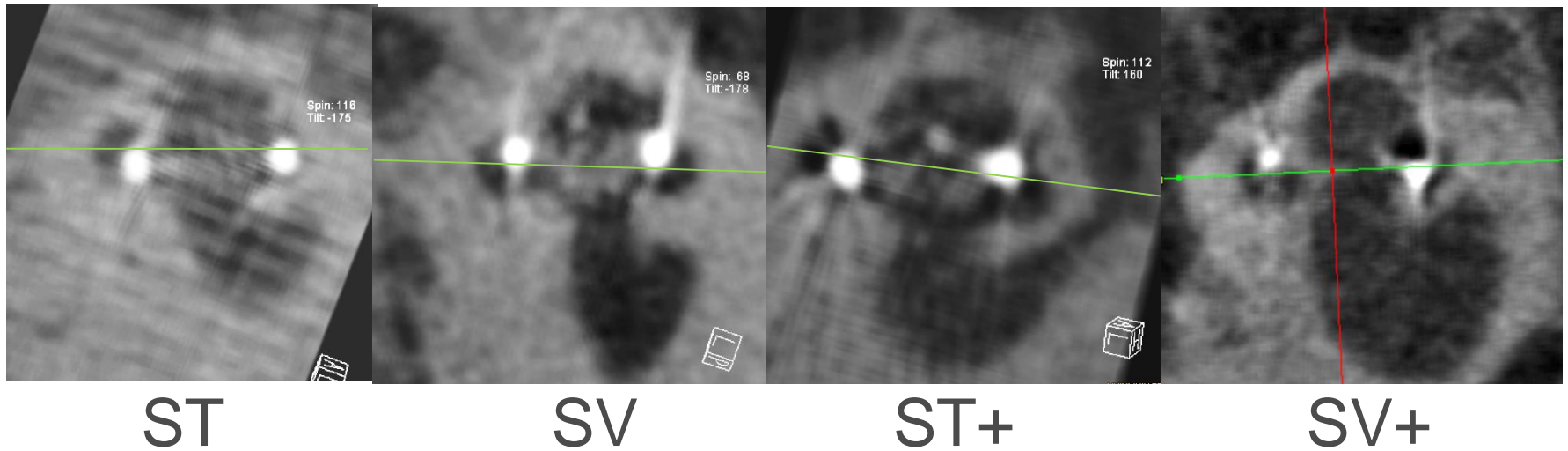


Flex EAS

ST insertion

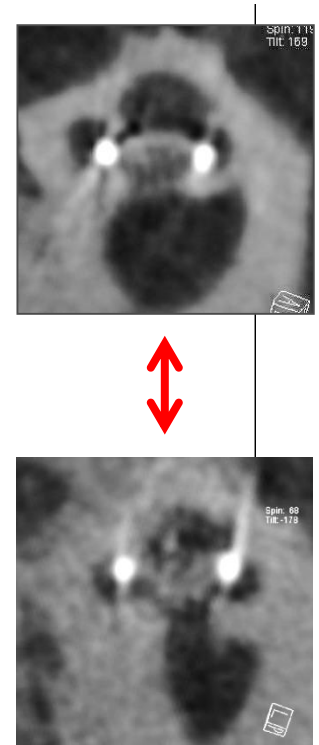
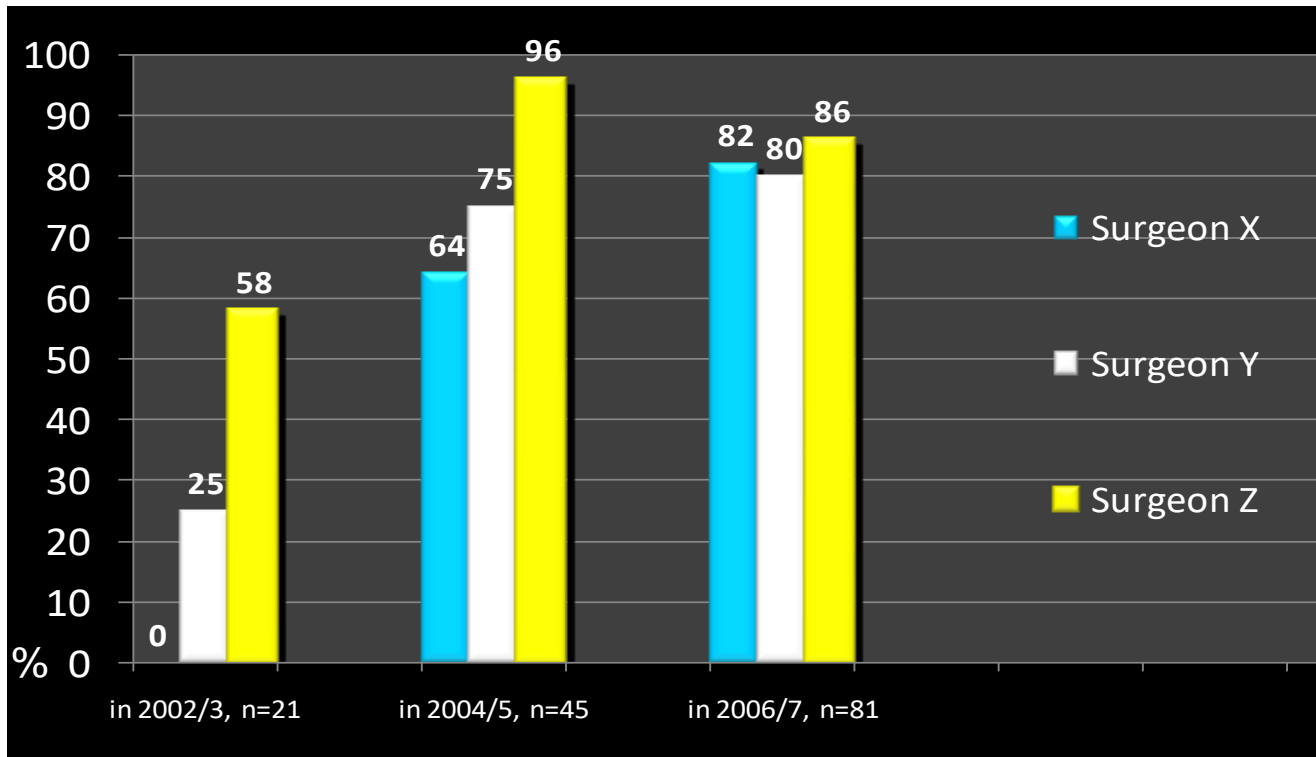
Ongoing Quality Study Freiburg

- 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

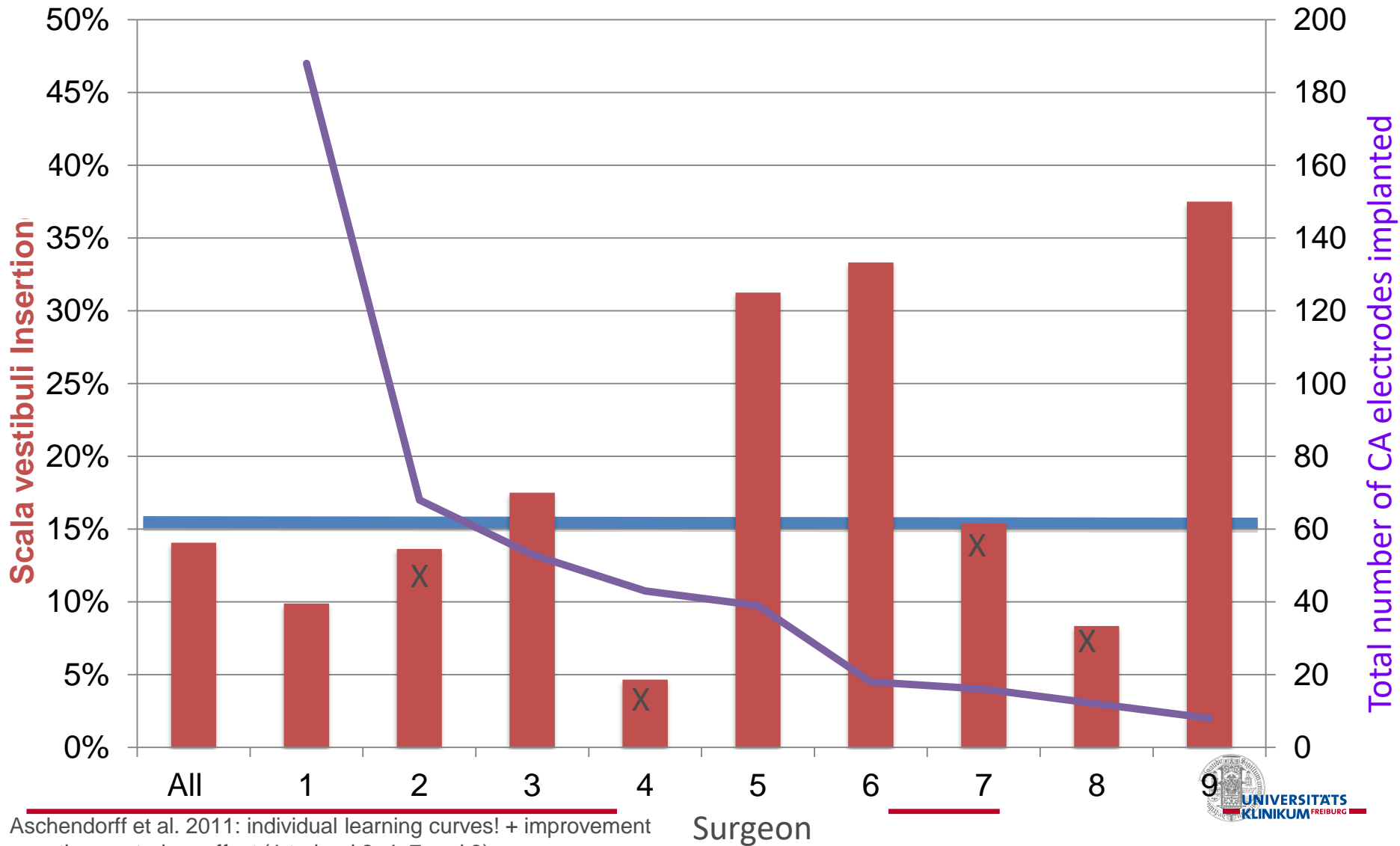


Scala tympani rates of 3 experienced surgeons following cochleostomy

+/- dislocation, individual differences, significant learning curves, n=147
(Aschendorff et al. 2011)



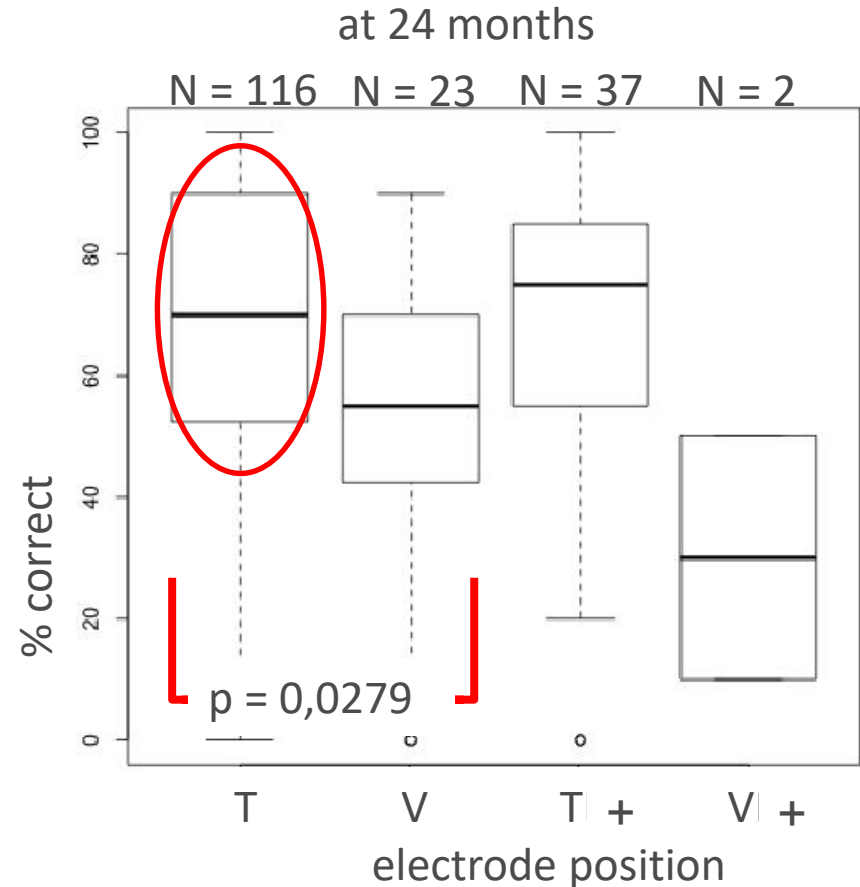
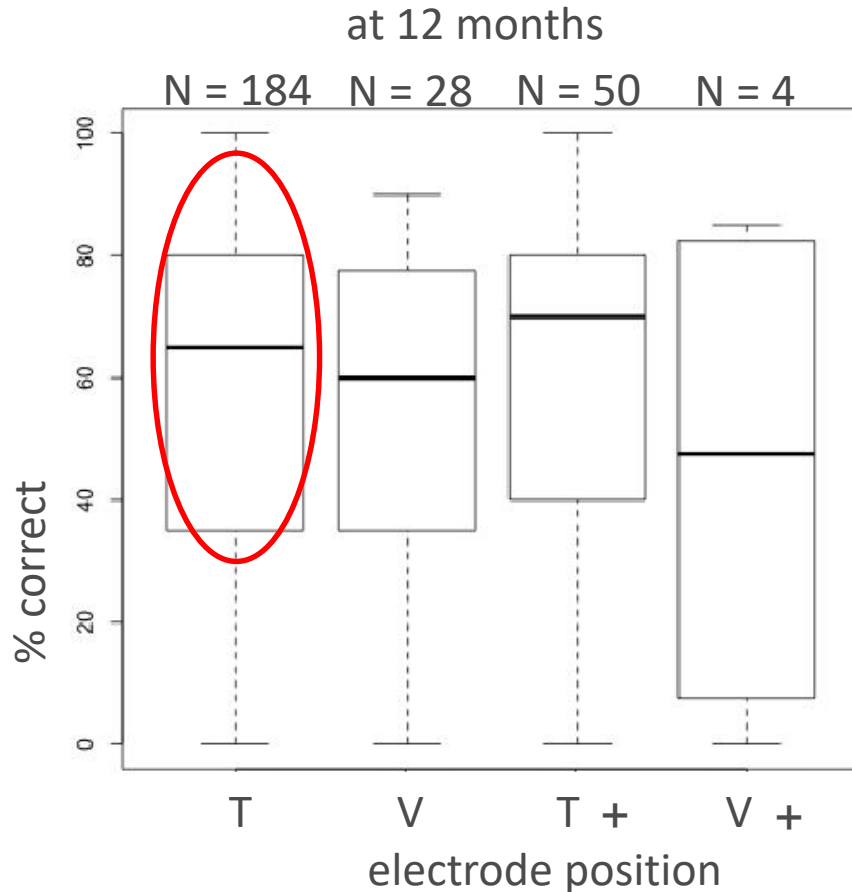
Electrode position II, Scala vestibuli rates



Aschendorff et al. 2011: individual learning curves! + improvement over time, x=trainer effect (1 trained 2, 4, 7 and 8)

Correlation with rehabilitation results?

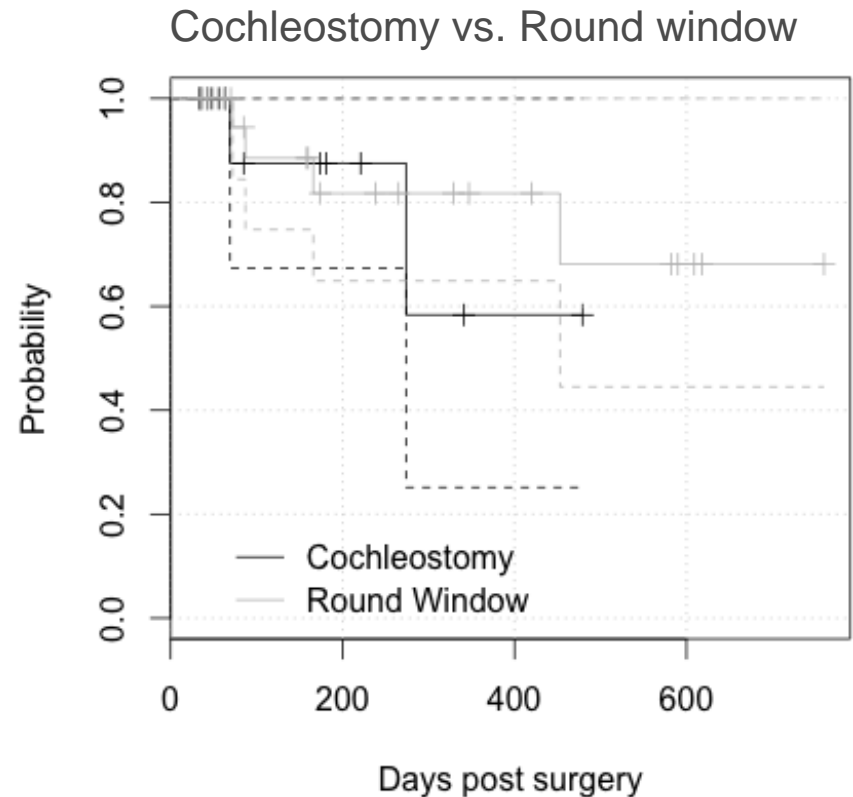
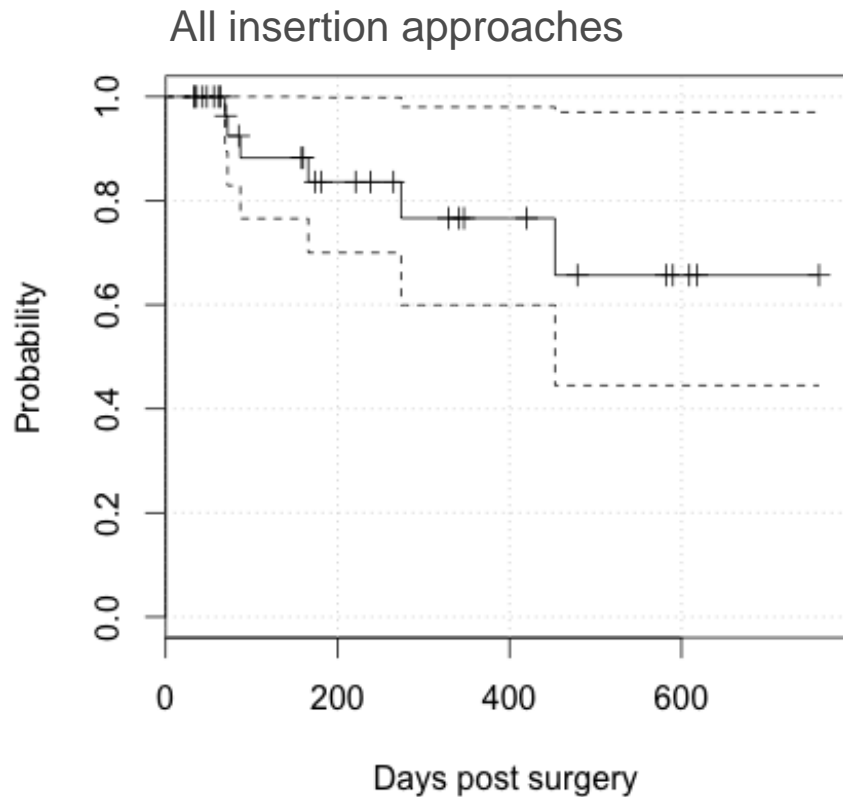
Freiburg monosyllables (70dB) (OISa: positive trend for ST, ceiling effect)



- Significant advantage of scala tympani insertions
- conservation of basal turn most important

Hearing loss: MedEL Flex 28

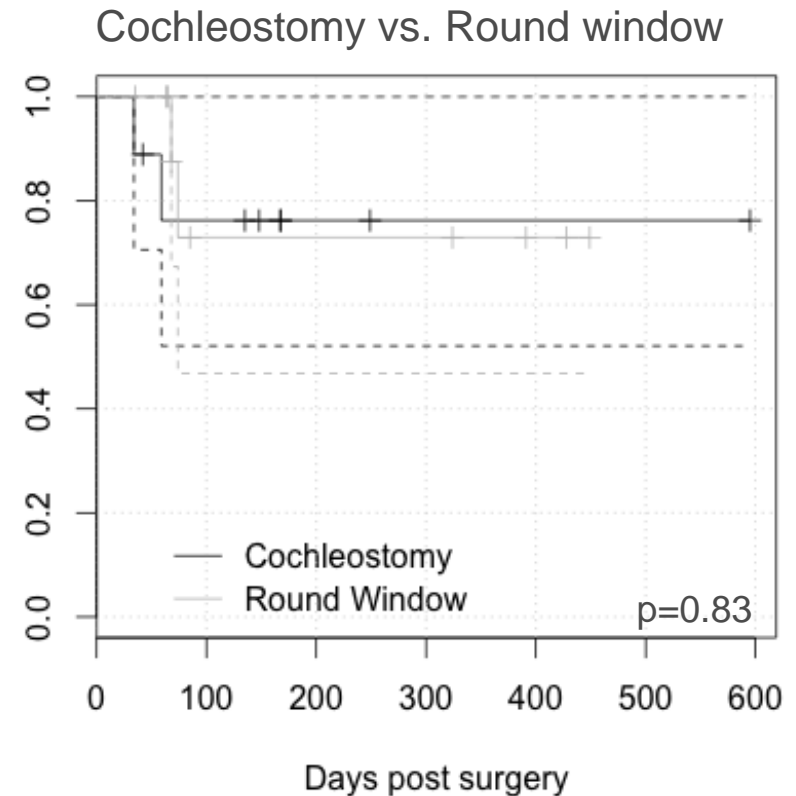
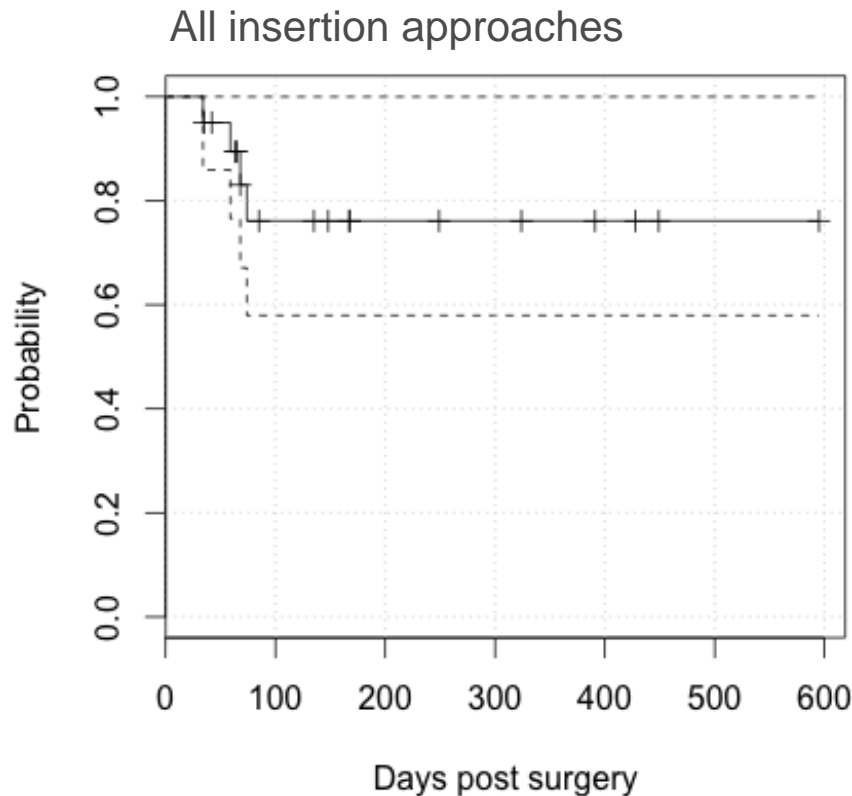
N=39, 14 cochleostomy, 25 round window, no sig. difference in preop-thresholds



- Probability of hearing conservation ~65%
- No sig. difference in regards to insertion approach

Hearing loss: AB Midscala

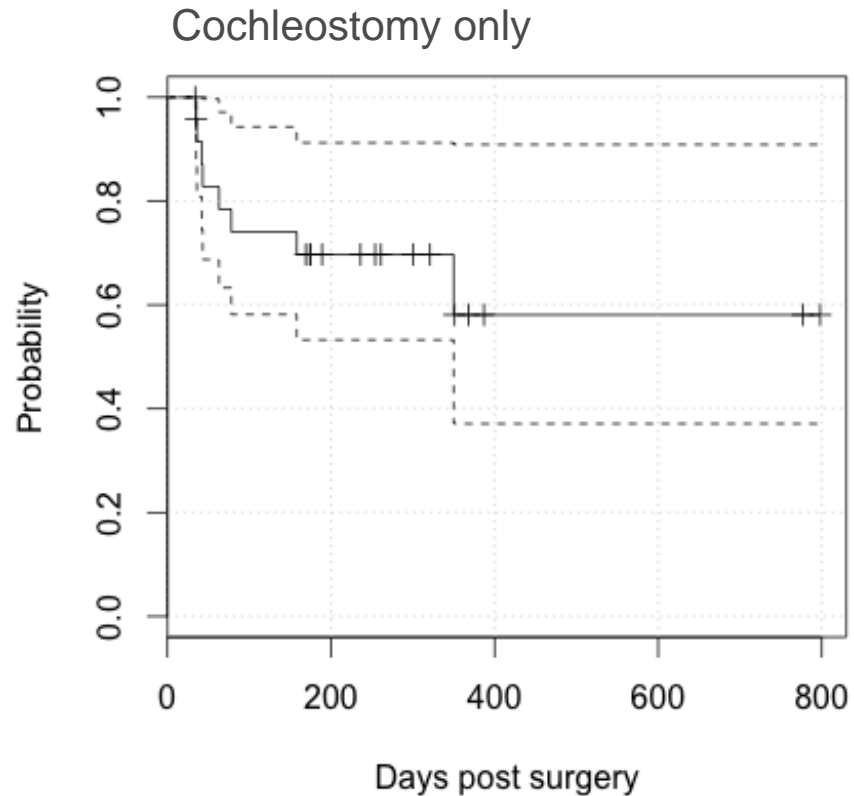
N=20, 9 cochleostomy, 11 round window, no sig. difference in preop-thresholds



- Probability of hearing conservation ~75%
- No sig. difference in regards to insertion approach

Hearing loss: Cochlear Contour Advance

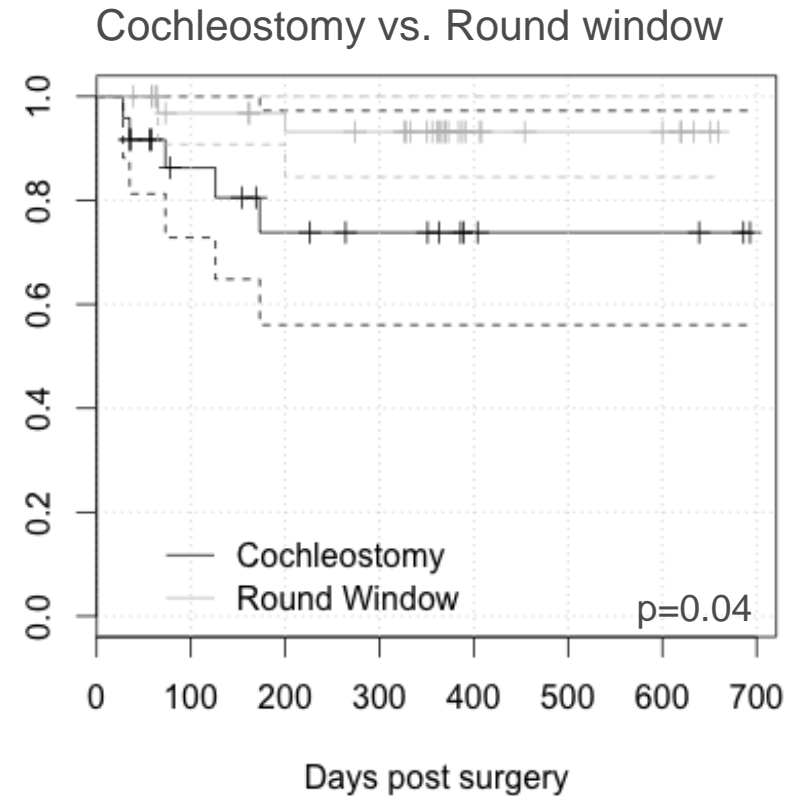
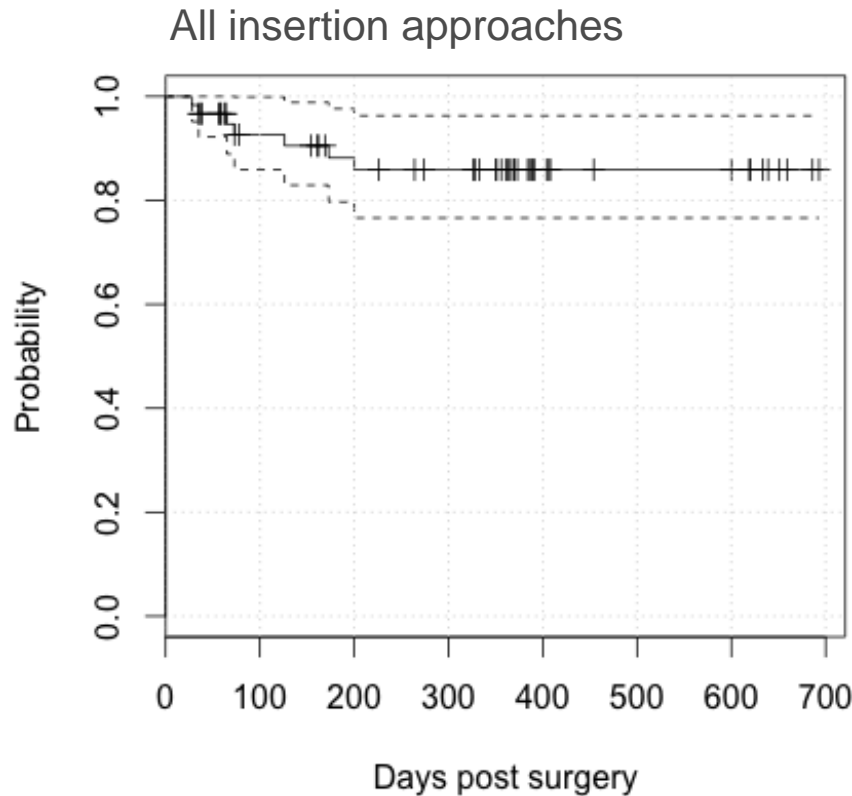
N=25, 25 cochleostomy, no round window



- Probability of hearing conservation ~60%

Hearing loss: Cochlear slim straight (CI422/CI522)

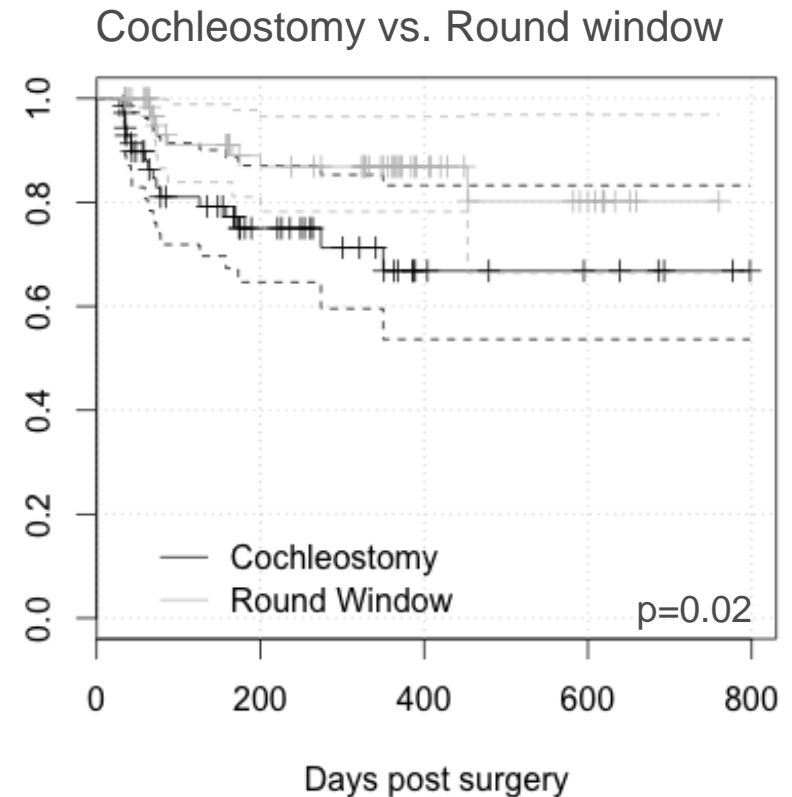
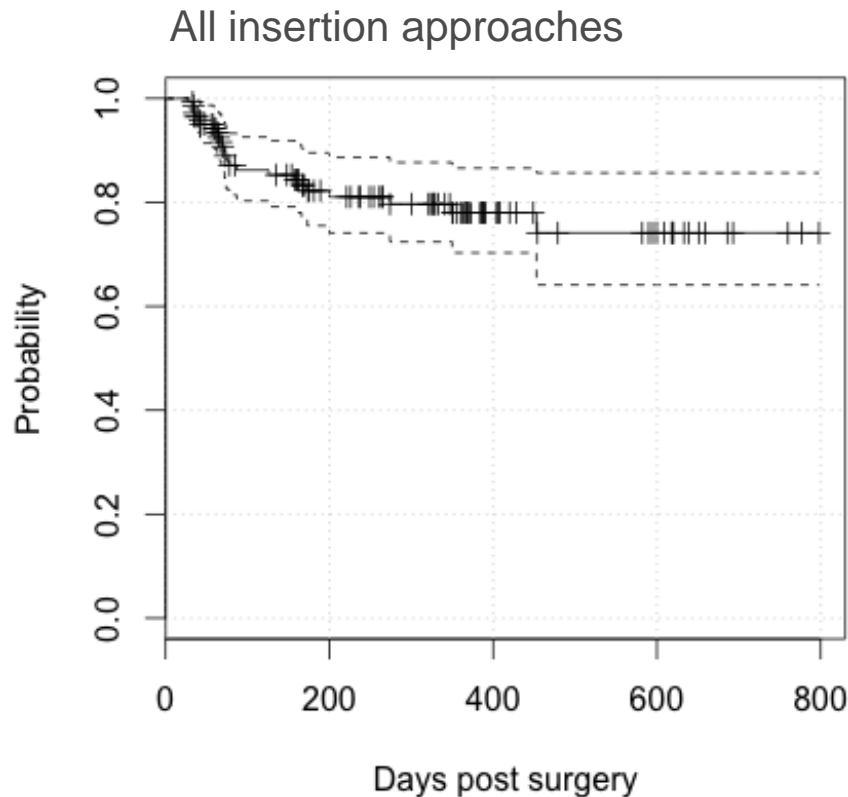
N=60, 24 cochleostomy, 36 round window, no sig. difference in preop-thresholds



- 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



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