Long-term Results of Auditory Abilities after Cochlear Implantation in Subjects with Unilateral Deafness

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• employed as a head of department at Unfallkrankenhaus Berlin
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• None
Why should unilateral deaf subjects be treated?

- 70 – 93 % have a high degree of difficulties in everyday speech understanding regardless of age (Wie et al., 2010)
- 54 – 84 % complain about tinnitus (van de Heyning et al., 2008)
- 12 – 41 % need additional educational assistance (Wazen et al., 2003)
- With single sided deafness are associated: stress, head aches, social isolation and psychological problems (Borton et al., 2010)
Conventional Treatment of Single-sided Deafness

- No treatment
- Fitted with CROS/BICROS
- Fitted with BAHA
Auditory Pathways
Single sided deafness
Aim of the Study

Mutual study of our Rehabilitation Center in Potsdam and the ENT Department of the Unfallkrankenhaus Berlin to demonstrate that single sided deaf subjects can fuse electrical and acoustical hearing and, therefore, are able to better understand speech in noise and also can localize.
Demographics

- 9 unilateral deaf subjects (4 single sided deaf subjects and 5 with asymmetric hearing loss), who have been implanted with an Advanced Bionics System (HiRes90K) between 3/2015 and 2/2016.
- 6 female, 3 male
- Mean age 58 years (37 – 82 years)
- Mean duration of deafness 5.5 years (0.6 – 28 years)
  - 1 outlier with 28 years of deafness – without the outlier the mean duration of deafness reduces to 2.4 years.
  - One subject with asymmetric hearing loss quit the study after 3 months due to personal reasons.
Study Protocol

• Speech tests in quiet and in noise preop. and after 3, 6 u. 12 months post fitting.
  – Freiburg monosyllabic words in quiet
  – Oldenburg sentence test (OLSA) in quiet
  – OLSA S0/N0 noise from front
  – OLSA S0/NCI noise on the implant side
  – OLSA S0/NNH noise on the hearing side

Results in quiet in % correct
Results in noise in SRT (SNR at 50% correct)

• Localization: Test preop. and after 12 months
  – Investigation of the absolute angle of presentation (7 loudspeaker setup), 49 trials for one test run
Pure Tone Audiograms
Freiburg Monosyllabic Words

Präop  3 Month  6 Month  12 Month

% correct

binaural  Ipsi (CI)
OLSA in Quiet

![Graph showing OLSA in Quiet](image)

- Binaural
- Ipsi (CI)
- Contra (NH)

% Correct

- Präop
- 3 Month
- 6 Month
- 12 Month
OLSA in Noise (S0N0)

Graph showing OLSA in Noise (S0N0) with conditions: binaural, Ipsi (CI), Contra (NH) for Präop, 3 Month, 6 Month, and 12 Month.
OLSA in Noise
S0NCI

OLSA in Noise (S0NCI)

- Praop
- 3 Month
- 6 Month
- 12 Month

binaural vs Contra (NH)
OLSA in Noise
S0NNH

OLSA in Noise (S0NNH)

- binaural
- Contra (NH)

SRT

Präop  3 Month  6 Month  12 Month

S

CI

NH N
Localization: Absolute Angle

Semicircle 7 Loudspeaker 30° Distance
Localization Results
Root mean square error (RMS)

Localization

Präop  NH  NH+CI

Mean Difference statistically significant p=0.038

Mean

Better
Summary

- 8 of the 9 implanted subjects could fuse electrical and acoustical hearing after some time. One subject quit the study after 3 month due to private problems.
- While speech tests in quiet revealed no great differences in binaural mode compared to results from the hearing side only, in all speech in noise tests results from binaural conditions were 1 – 2 dB better than from the hearing side alone.
- All subjects tested were able to localize. The mean difference between localization with and without implant was statistically significant (p=0.038).
- Also, all subjects reported improved benefit in everyday live.
Thank you very much for your attention!