Preservation of functional acoustic hearing following cochlear implantation

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Does hearing preservation matter?
For the ½ empty group...

Hearing preservation doesn’t matter because...

– it isn’t helping anyway.
– my patients already do well.
– surgery takes more time...
  – and can be more difficult.
– patients will lose hearing over time.

Are we setting ourselves up for failure?
For the $\frac{1}{2}$ full group...
Research Questions

What is functional preserved hearing?

Why would adding a 2\textsuperscript{nd} acoustic hearing ear be beneficial for speech understanding?
Bimodal hearing

CI + HA  \( \times \)  HA
n = 132
AzBio +5 (% correct)

HA only
CI only
CI + HA (bimodal)

conditions

n = 132
Bimodal hearing: **PROS**

Significant benefit adding HA to CI for speech understanding

- Shallop et al., 1992; Armstrong et al., 1997; Tyler et al., 2002; Ching et al., 2004; Dunn et al., 2005; Mok et al., 2006; Gifford et al., 2007; Dorman et al., 2008, 2009, 2010; etc., etc.

Significant benefit for music perception and more “natural” sound quality

- Gantz et al., 2005; Gfeller et al., 2006, 2007; Dorman et al., 2009
Bimodal hearing: **CONS**

HA and CI provide disparate information

- Level
- Spectrum
- AGC

→ Disruption of...

- Interaural level differences (ILDs)
- Interaural time differences (ITDs)
  - Spatial hearing difficulty, speech understanding in noise and reverberation
Best-aided EAS
Hearing preservation: **PROS**

Significant benefit adding *acoustic hearing in the implanted ear* to CI for speech understanding...

- over the bimodal condition
- In complex listening environments

- Dunn et al., 2010; Gifford et al., 2010, 2013; Dorman et al., 2012; Rader et al., 2013
AzBio +5 (% correct)

bilateral HA
CI + ipsi HA
CI + contra HA
CI + bilateral HA

17 percentage points!
Hearing preservation: **PROS**

Significant benefit adding *acoustic hearing* in the *implanted ear* to CI for speech understanding...

- over the bimodal condition
- In complex listening environments

- Dunn et al., 2010; Gifford et al., 2010, 2013; Dorman et al., 2012; Rader et al., 2013

Even in cases where significant hearing is lost:
- Postop > preop
n = 26
Hearing preservation: **PROS**

Potential to preserve ITDs

→ *binaural hearing* with a cochlear implant!
Hearing preservation: **CONS**

→ What do we have to lose?

- **NOTHING!**
I HAVE NOTHING BAD TO SAY
ABOUT HEARING PRESERVATION!

I SAY IT REGULARLY
Hearing preservation—CONS

With respect to speech understanding, patient satisfaction, and spatial hearing

→ What do we have to lose?
  ▪ NOTHING!

HOWEVER...it adds complexity to the audiological management of our patients.
QUESTIONS

- How much preserved hearing is needed?
- How does hearing preservation affect spatial hearing?
- Surgical considerations?
- Patient counseling?
Thank you.
ITD threshold (µsec)

MEAN