In The Name of GOD

ABR findings in Minimal Hearing loss

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Minimal Hearing Loss

group of configurations :

(some minor variations in definitions across studies from 1999 to 2020)

mild hearing losses :

one or more thresholds fall between 20 and 40 dB HL

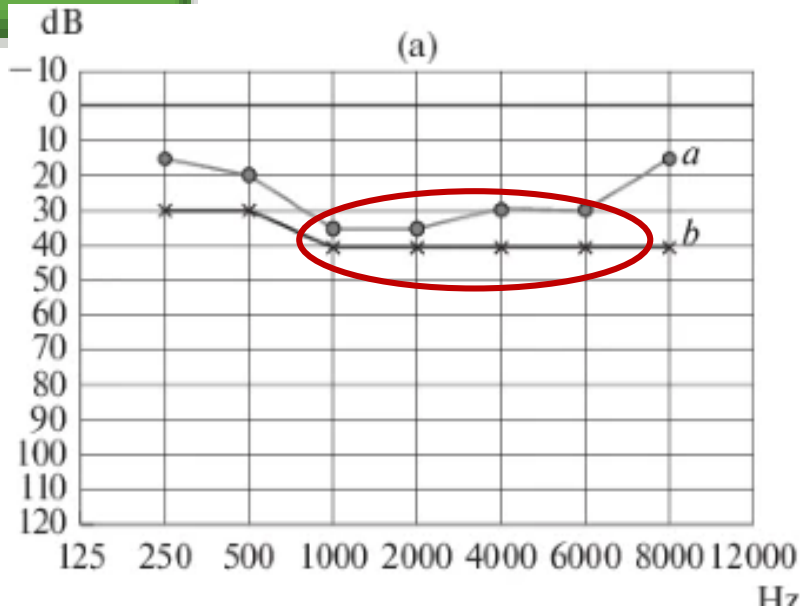
unilateral losses :

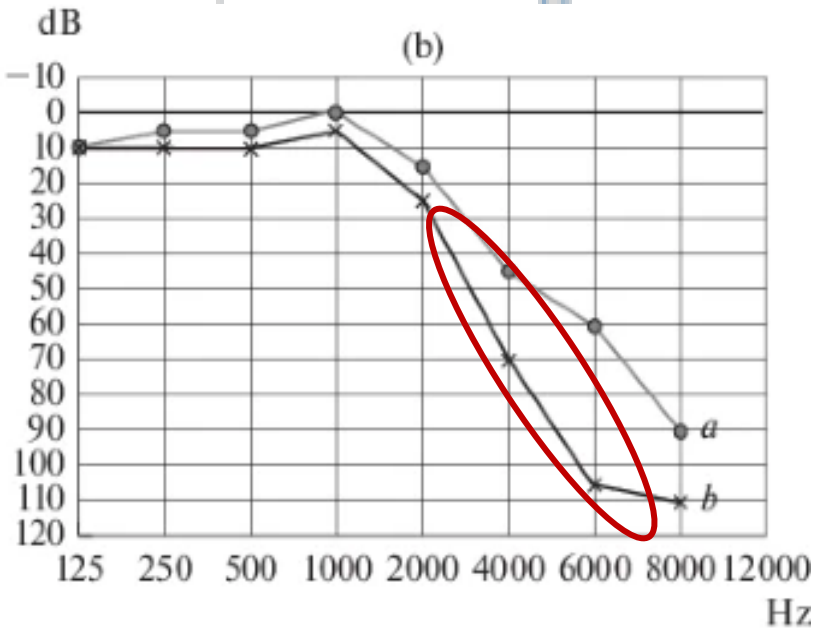
normal thresholds in one ear (≤15 dB HL) with some degree of hearing loss in the other ear

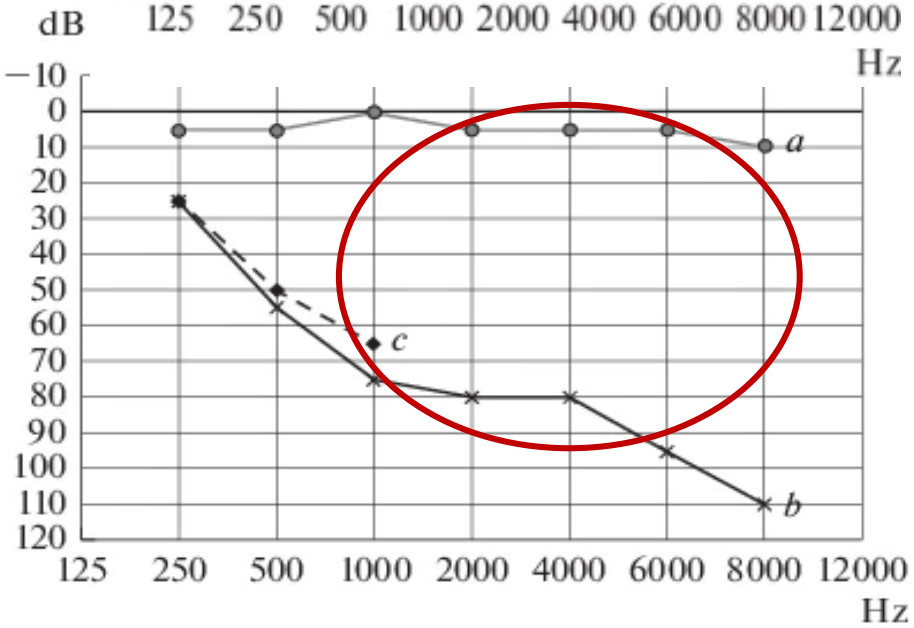
high-frequency losses :

normal-hearing thresholds at frequencies below 2 kHz (≤15 dB HL) and thresholds that exceed 25 dB HL at 2-8kHz.

Minimal or subtle or slight hearing loss







Conductive
Sensorineural hearing loss
(including auditory neuropathy)
Mixed hearing loss

occurrences of minimal hearing impairments:

0.55/1000 births (1/2000)

increasing up to 54/1000 children by the school age (5%)

unilateral and bilateral minimal impairments problems :

(1) difficulty with comprehending the speaker, especially, in background noise;

(2) difficulties following verbal complicated directions;

(3) speech disorders;

(4) low level in writing and reading skills;

(5) decreased attention, poor motivation, quick fatigue,

*Listening effort (dual tasks)

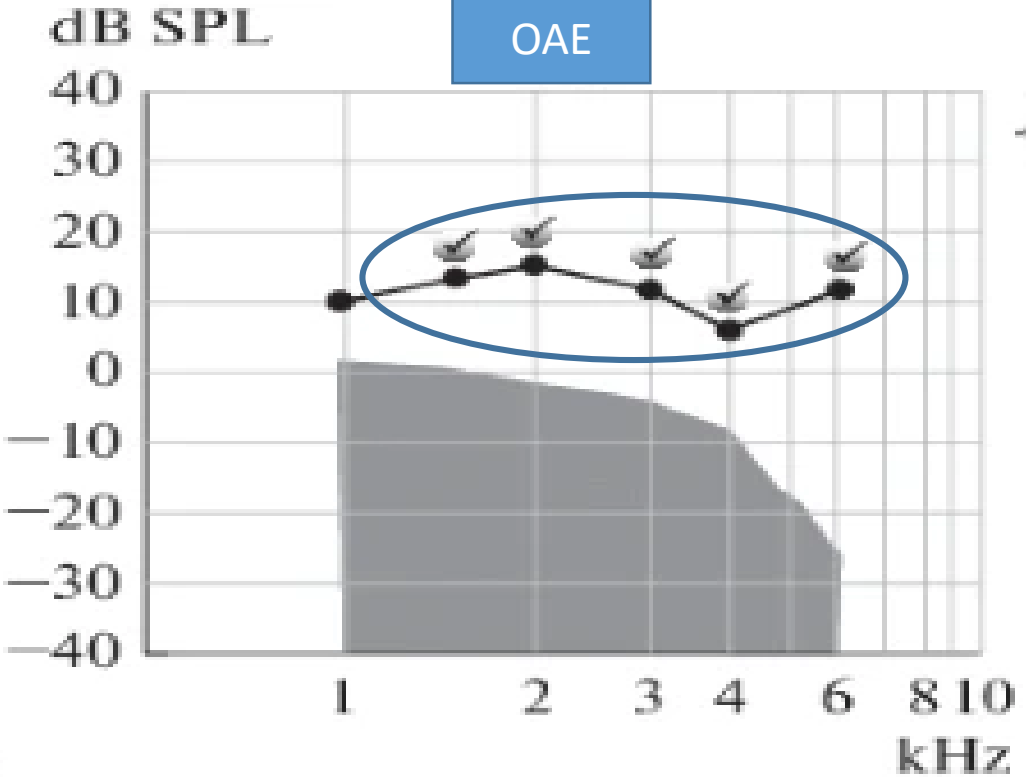
(6) behavioral problems, such as unmotivated aggression, inadequate behavior, stress;

(7) problems with localizing the source of sounds (in children with unilateral HL).

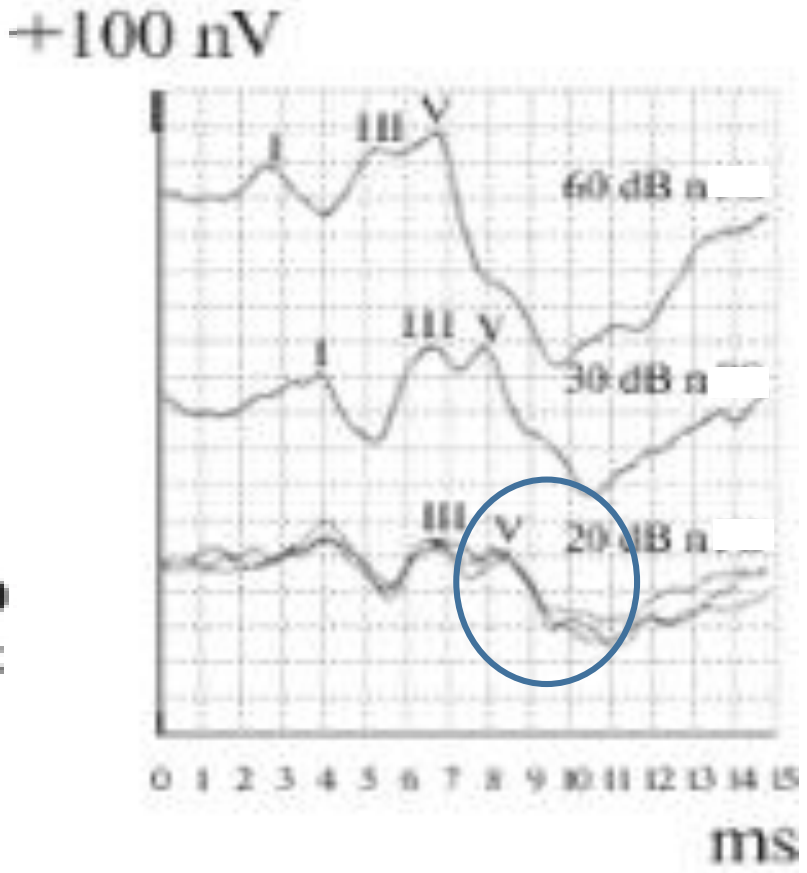
***37-45% of minimal HL students ……..intervention in case-by-case basis (AAA,2003)**

***3% of normal hearing students**

OAE



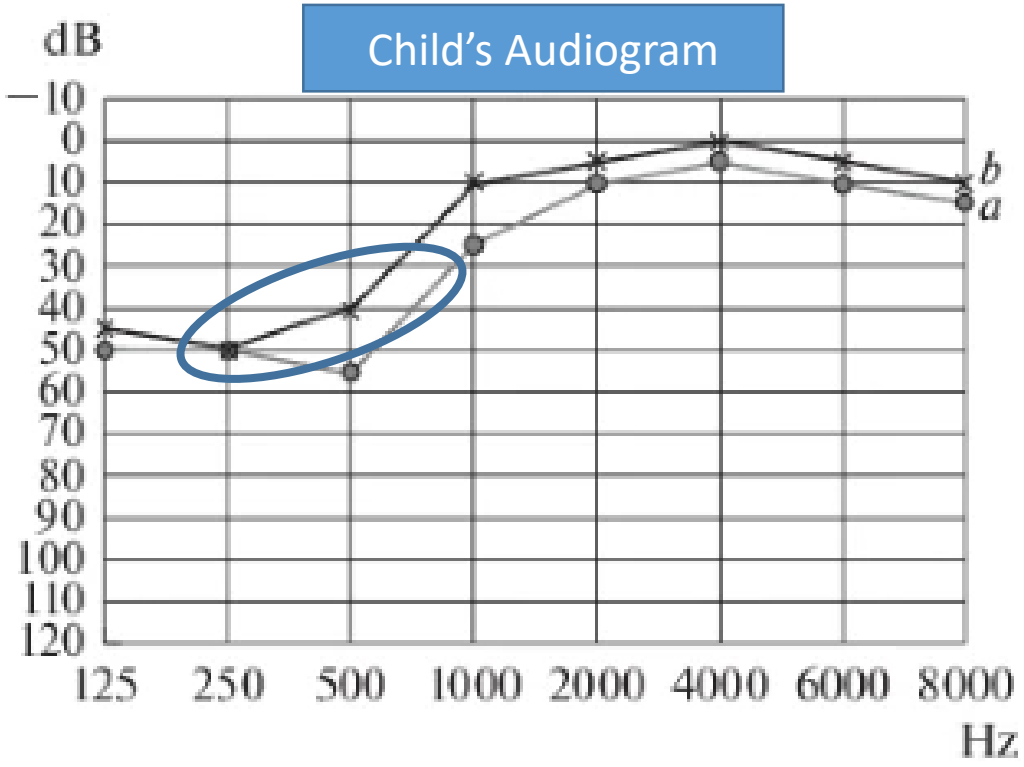
Click-ABR



Audiologist: Everything looks good

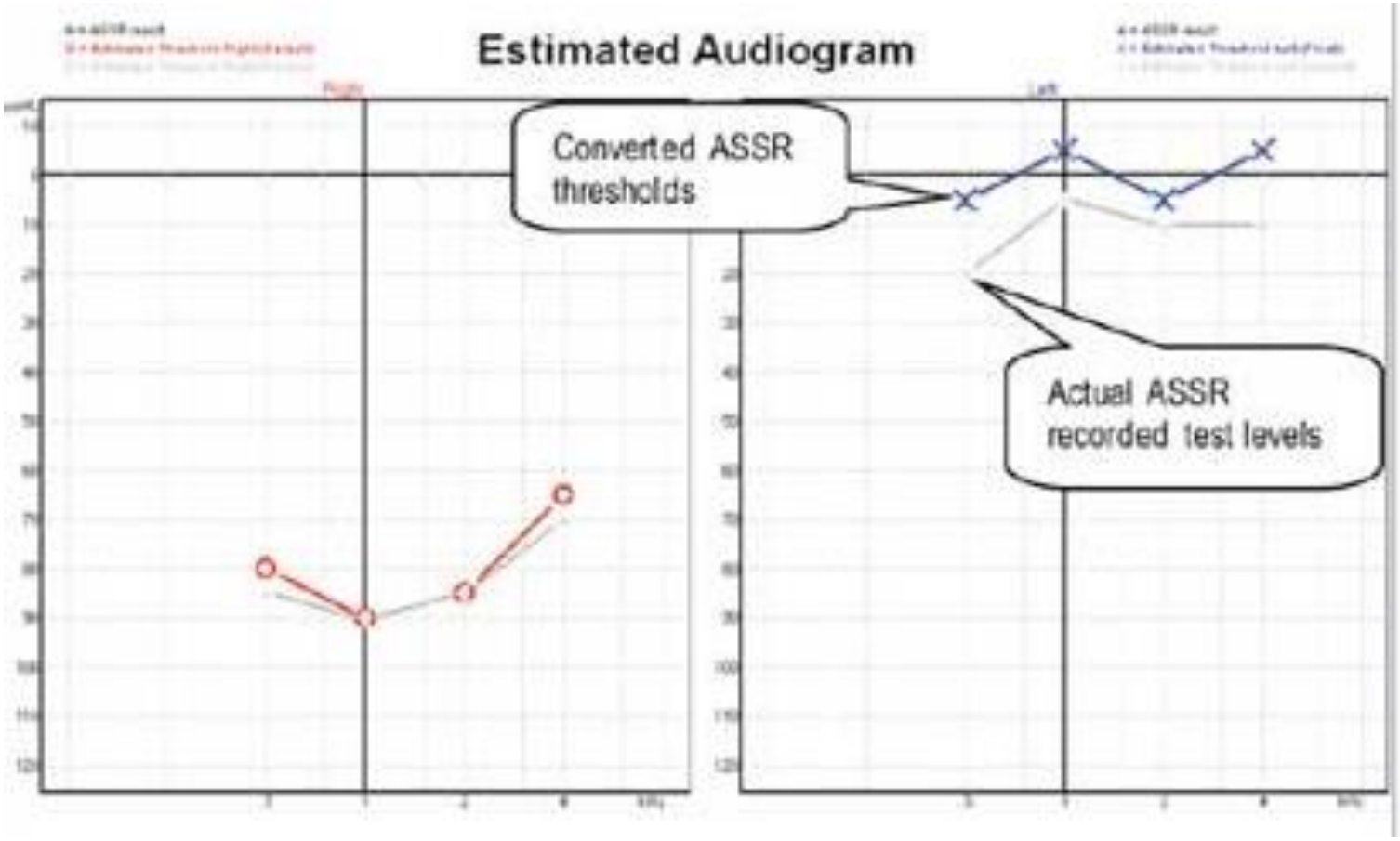
BUT...??

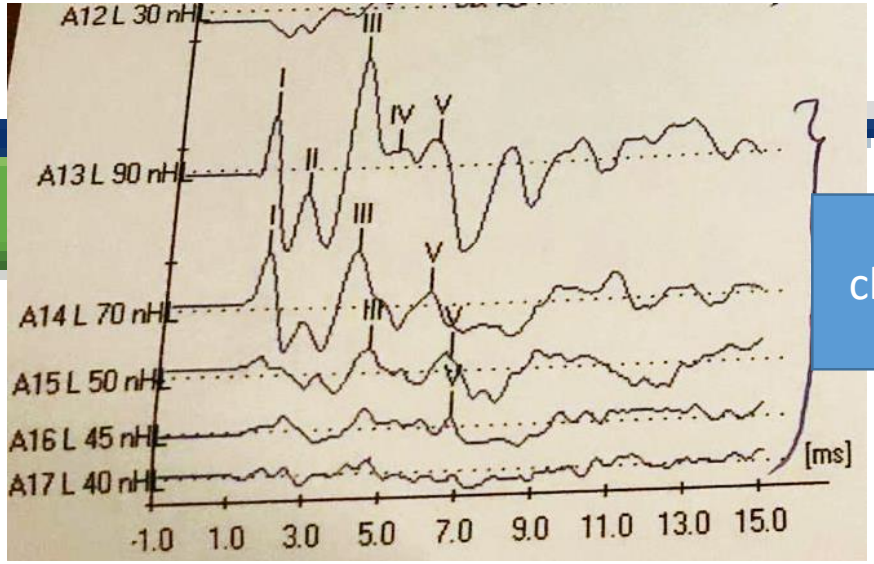
Bilateral Mild Low frequency SNHL



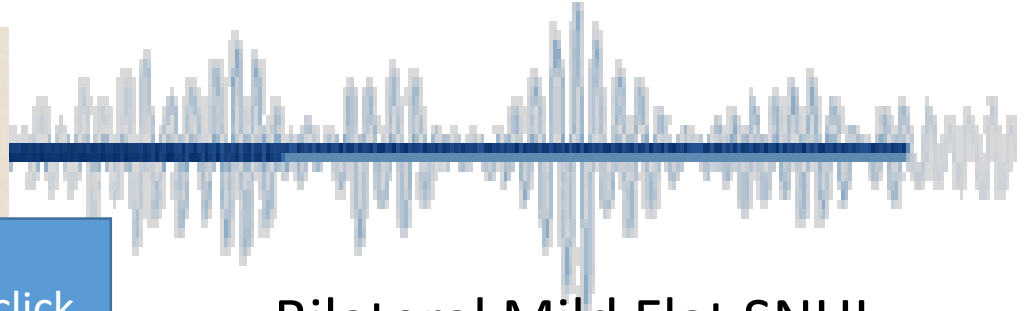
- Tone burst ABR (500Hz)……..

ASSR ???


Estimated Audiogram
Converted ASSR thresholds
Actual ASSR recorded test levels

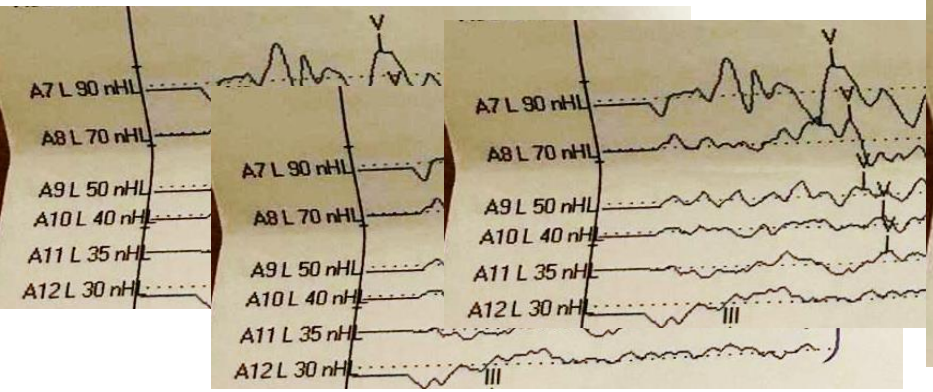


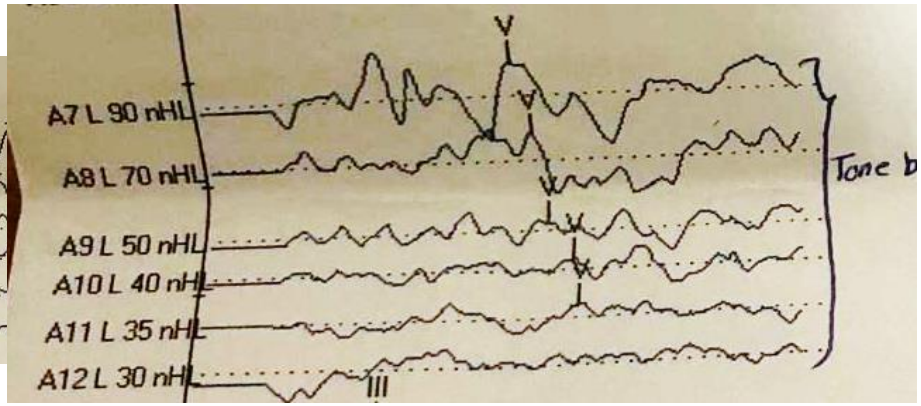
click



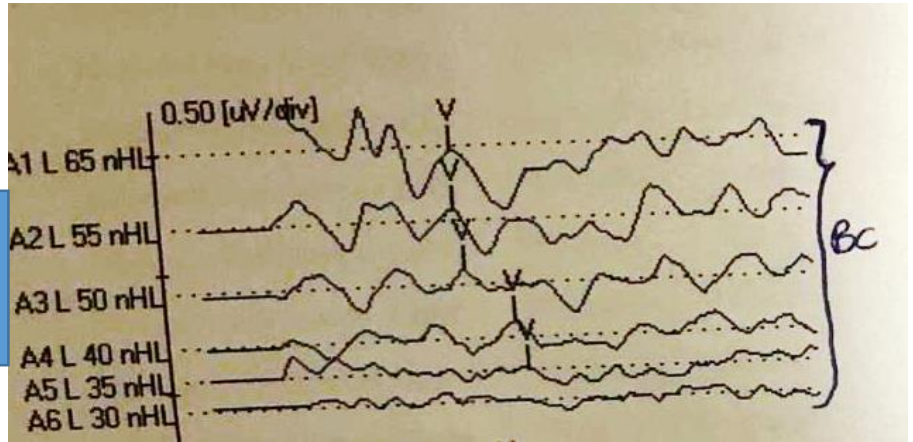
Bilateral Mild Flat SNHL

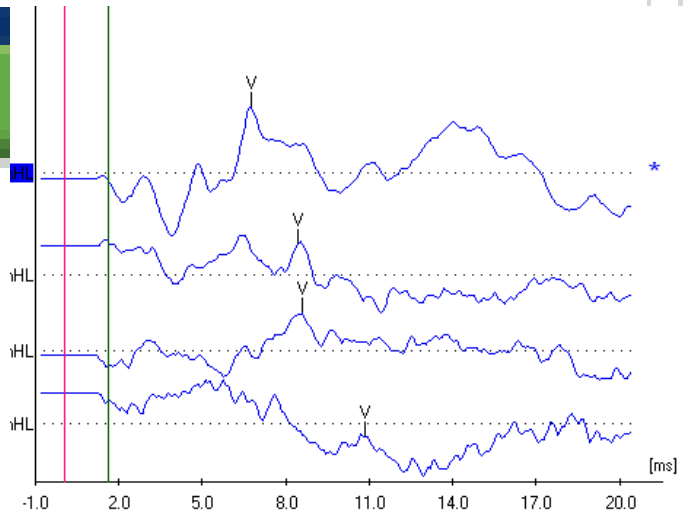
Tone Burst
4,2,1,0.5



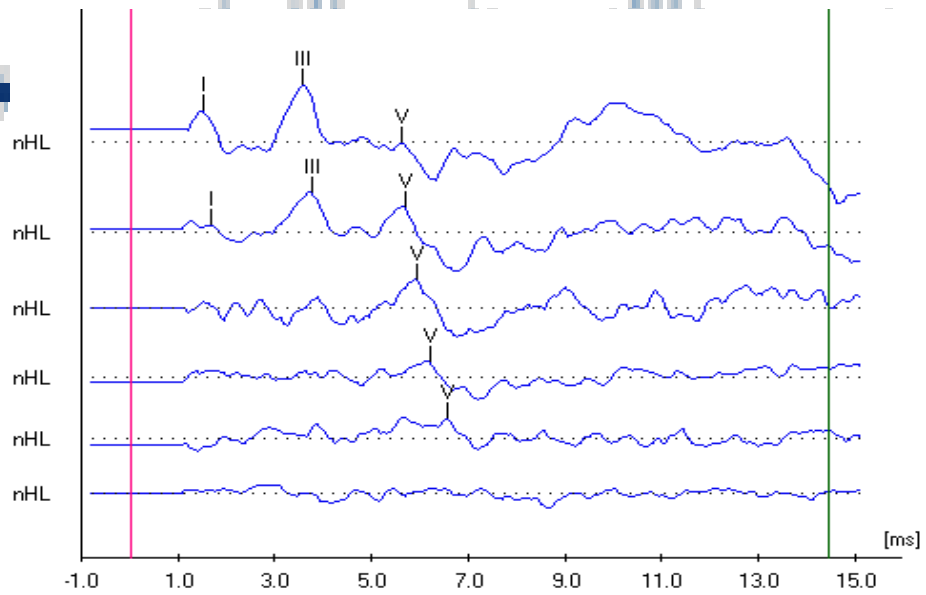


BC



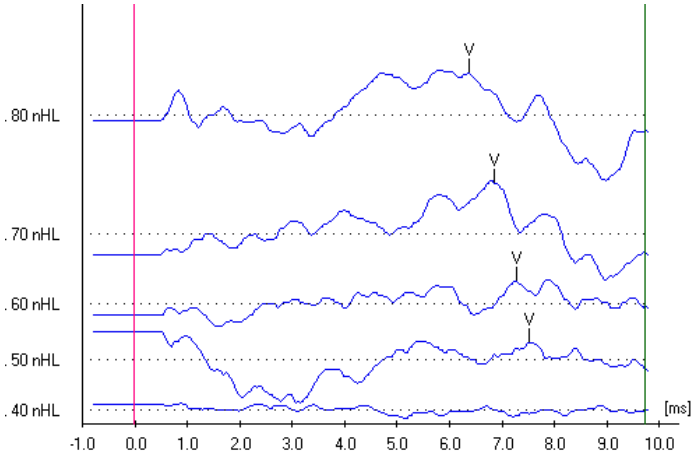


500….. 20

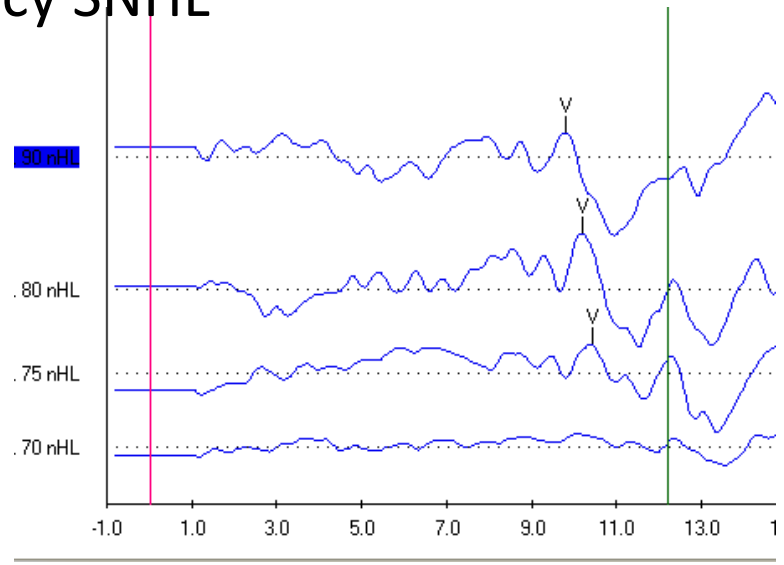


1000….. 15

high frequency SNHL

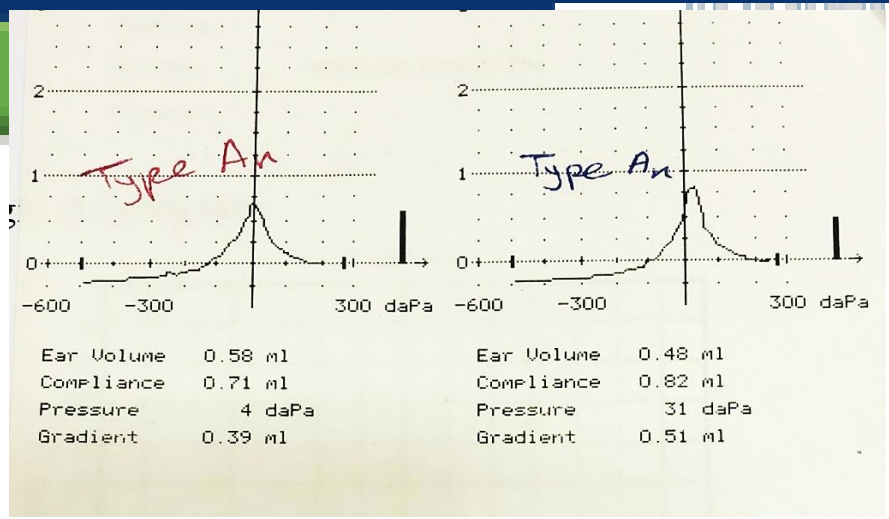


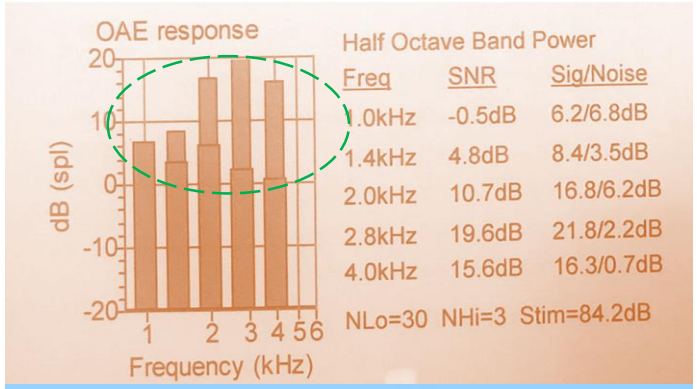
2000….. 50

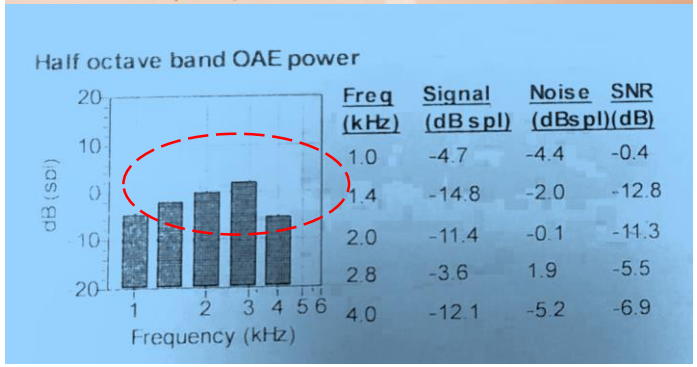


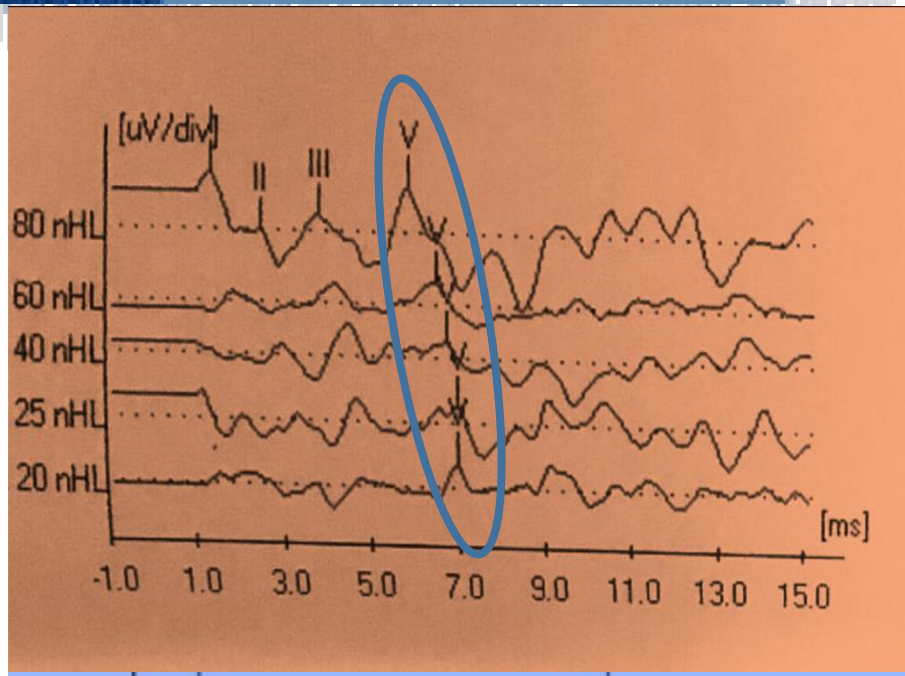
4000….. 75

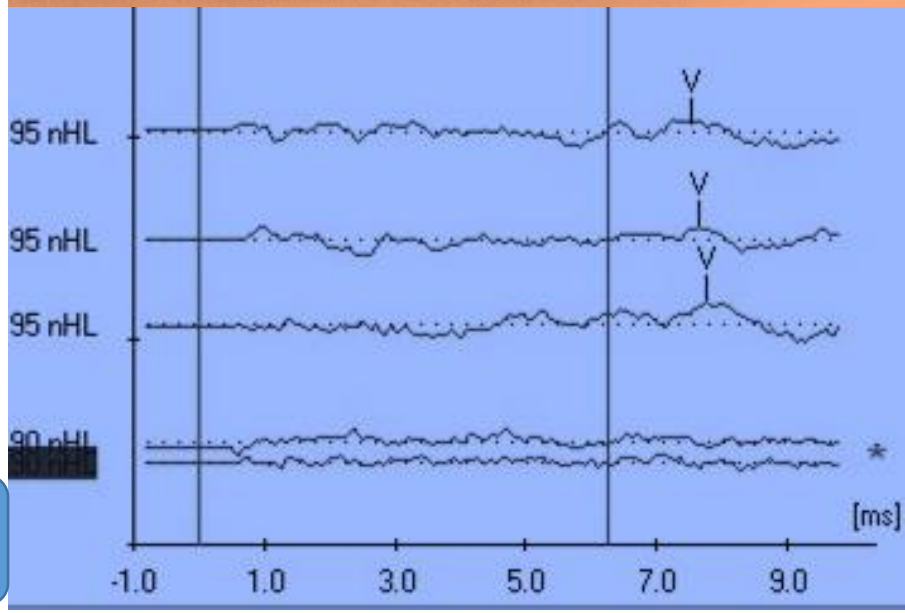
Unilateral hearing loss



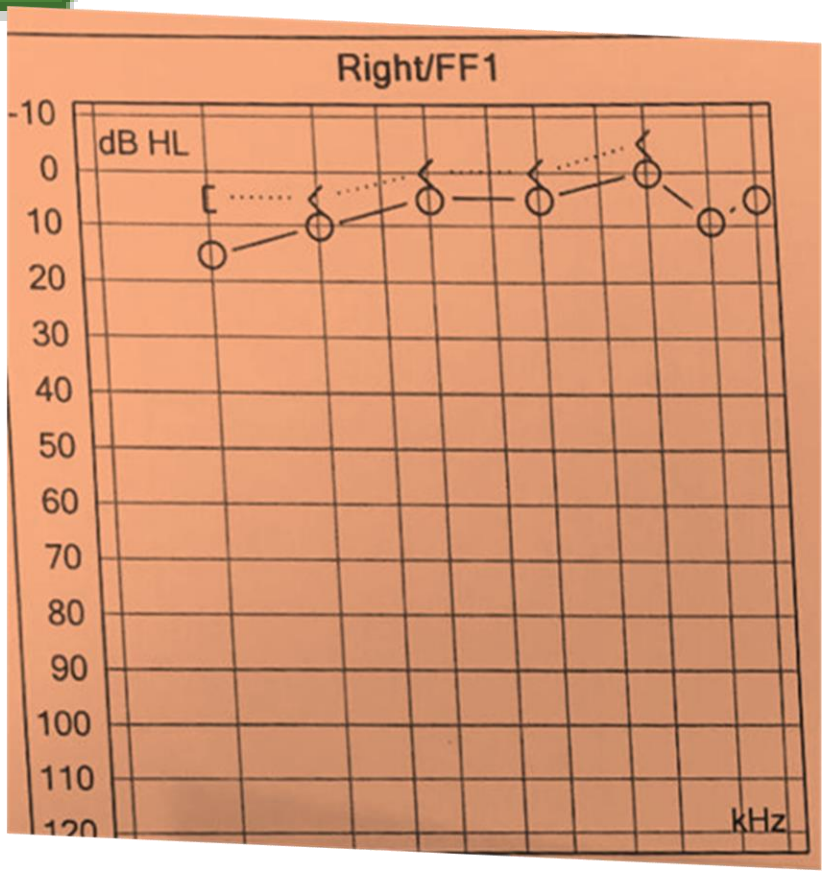


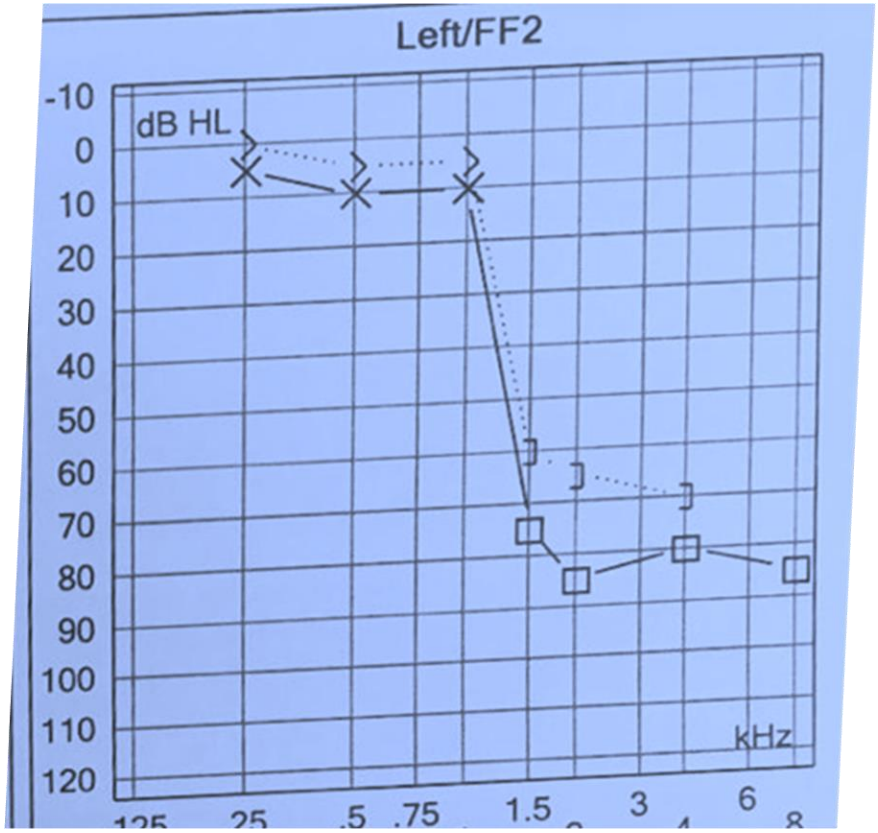




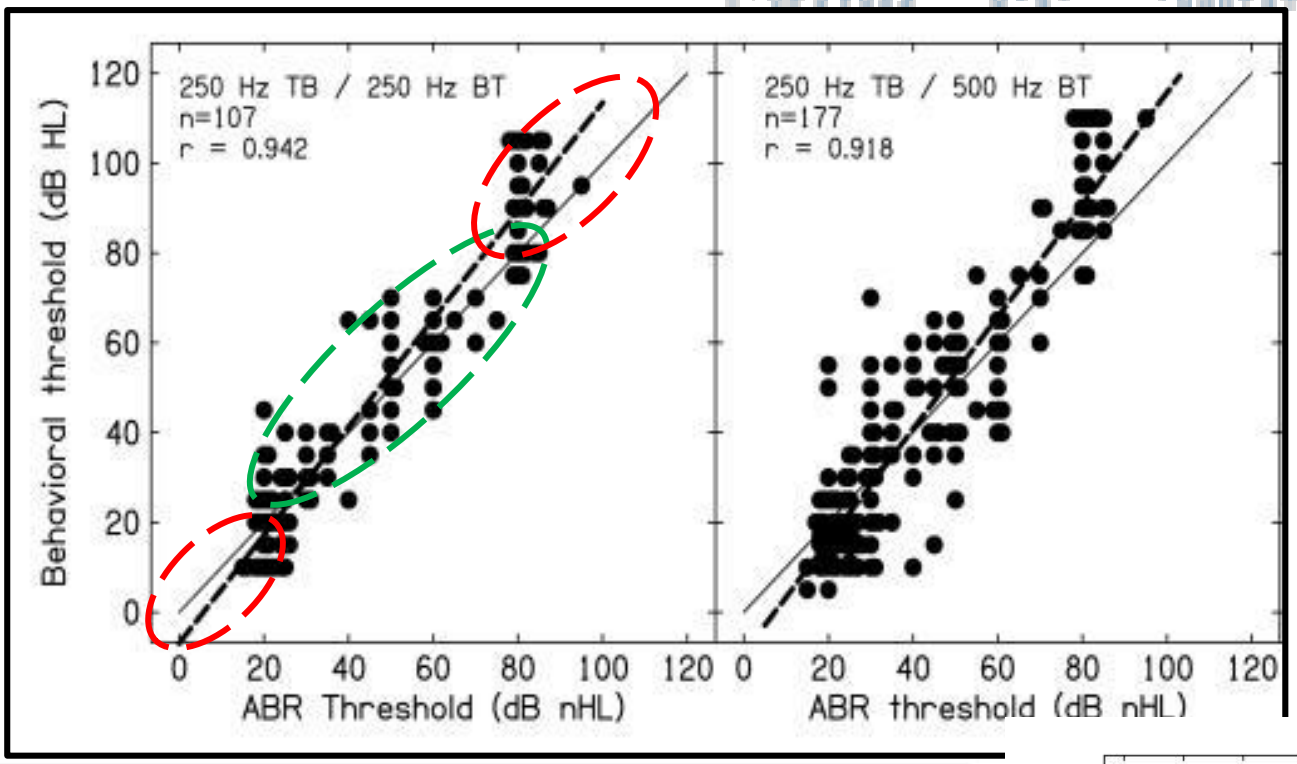


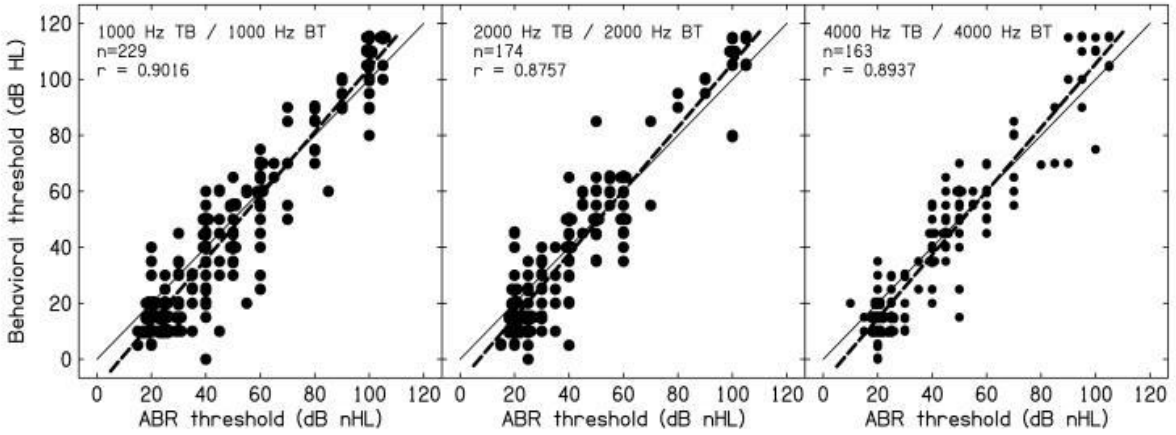
with masking

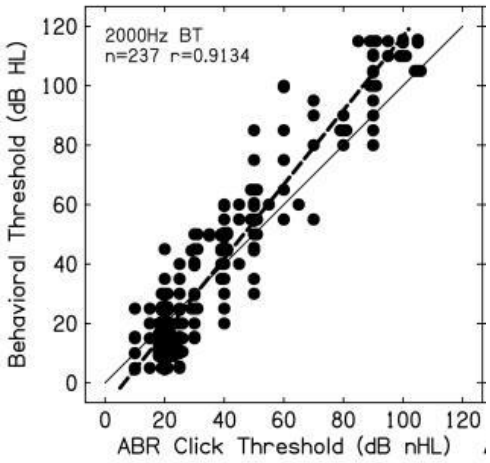

Right/FF1
dB HL
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
kHz


Left/FF2
dB HL
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
kHz
125
25
.5
.75
1.5
3
6
8

ABR: overestimated when hearing is normal
underestimated when significant hearing loss exists







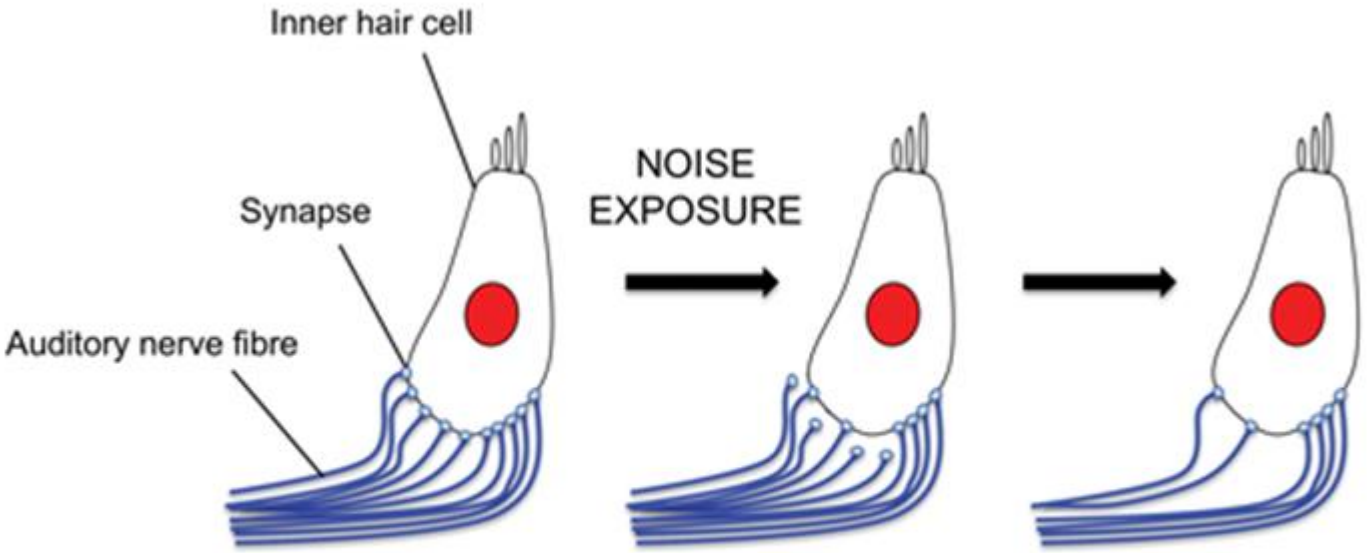
What about ASSR ??

Take-home message

- Importance of early detecting minimal hearing impairments (ABR / DP-OAE)
- Re-test 2-3 times each year (follow-up)
- Interventions or Recommendations (communication strategies ,…)
- Increasing SNR (FM, remote Mic,…)
- Case-by-Case decision

Hidden Hearing Loss

Cochlear Synaptopathy



about 40-50% loss within **an hour**

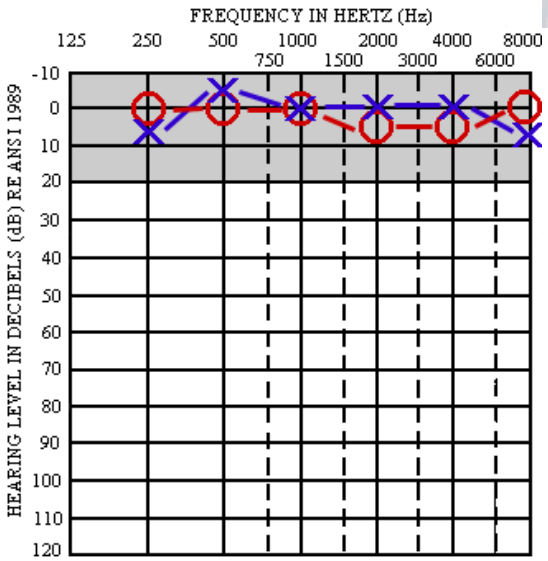
(**in days**)

Spiral ganglion cell loss

years to perhaps decades

***Big Chance**

How can so many of fibers die without affecting threshold sensitivity?



1/ Low-SR fibers make up about 40% of the total population of cochlear nerve fibers that communicate with the IHCs.

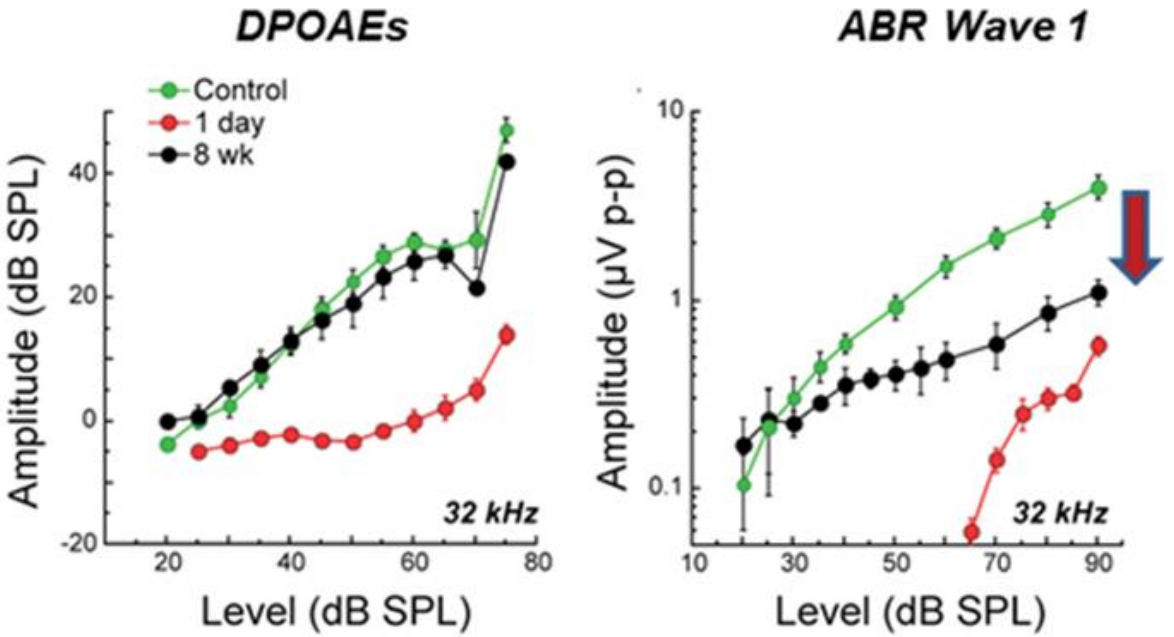
2/ they don’t contribute to threshold detection in the normal ear.

3/ so their loss doesn’t elevate thresholds

-**increase central gain…… make Tinnitus , Hyperacusis , APD

How diagnose cochlear synaptopathy in patients ??

- IHC summating potentials (SPs)
- Supra threshold cochlear nerve responses captured by CAP (ECoG),
-ABR wave I
-EHF audiometry
- Speech in noise tests



Kujawa and Liberman, 2009


In the middle of difficulty lies opportunity
Albert Einstein