AUDITORY TESTS

USING ELECTRICAL STIMULATION

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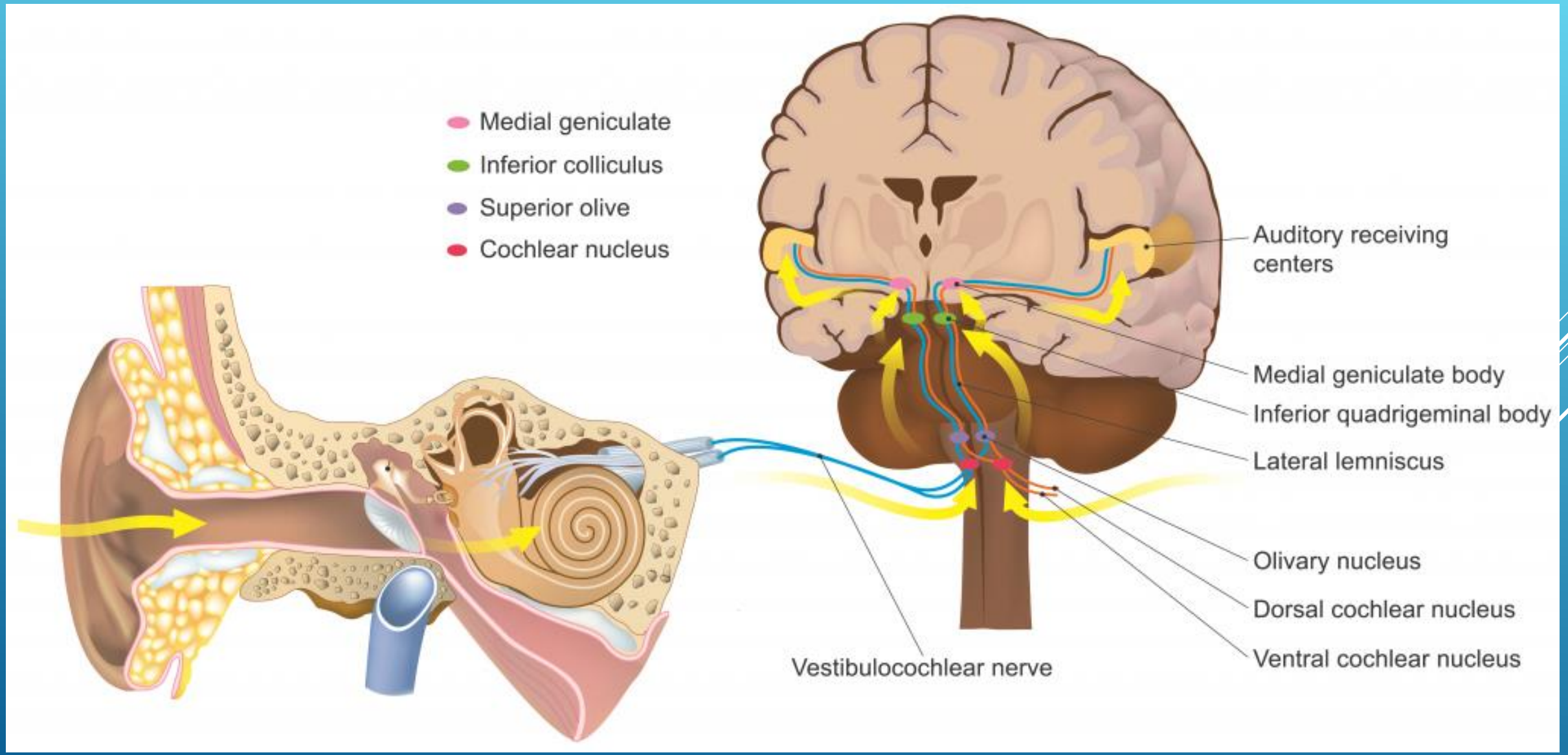
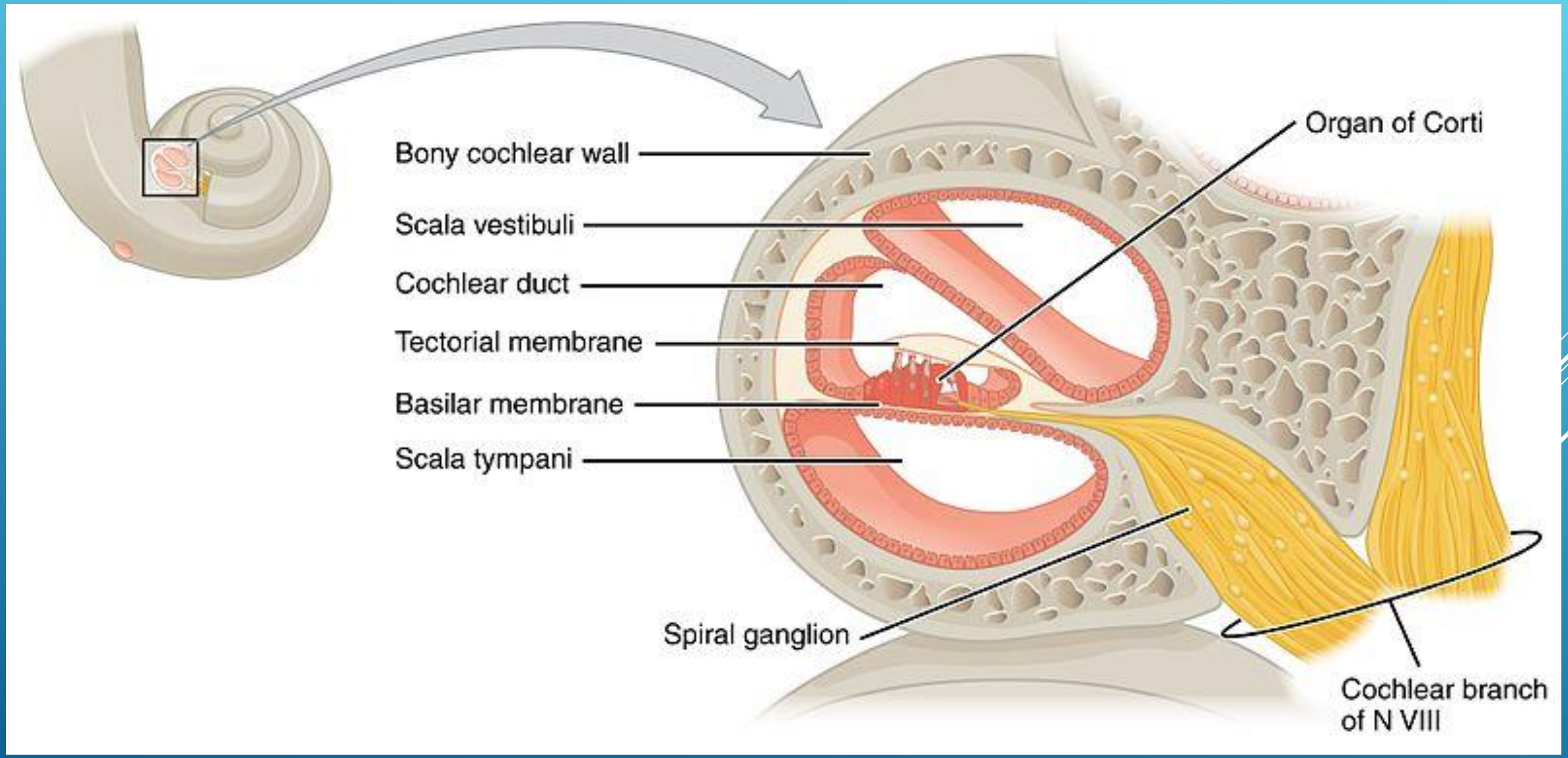
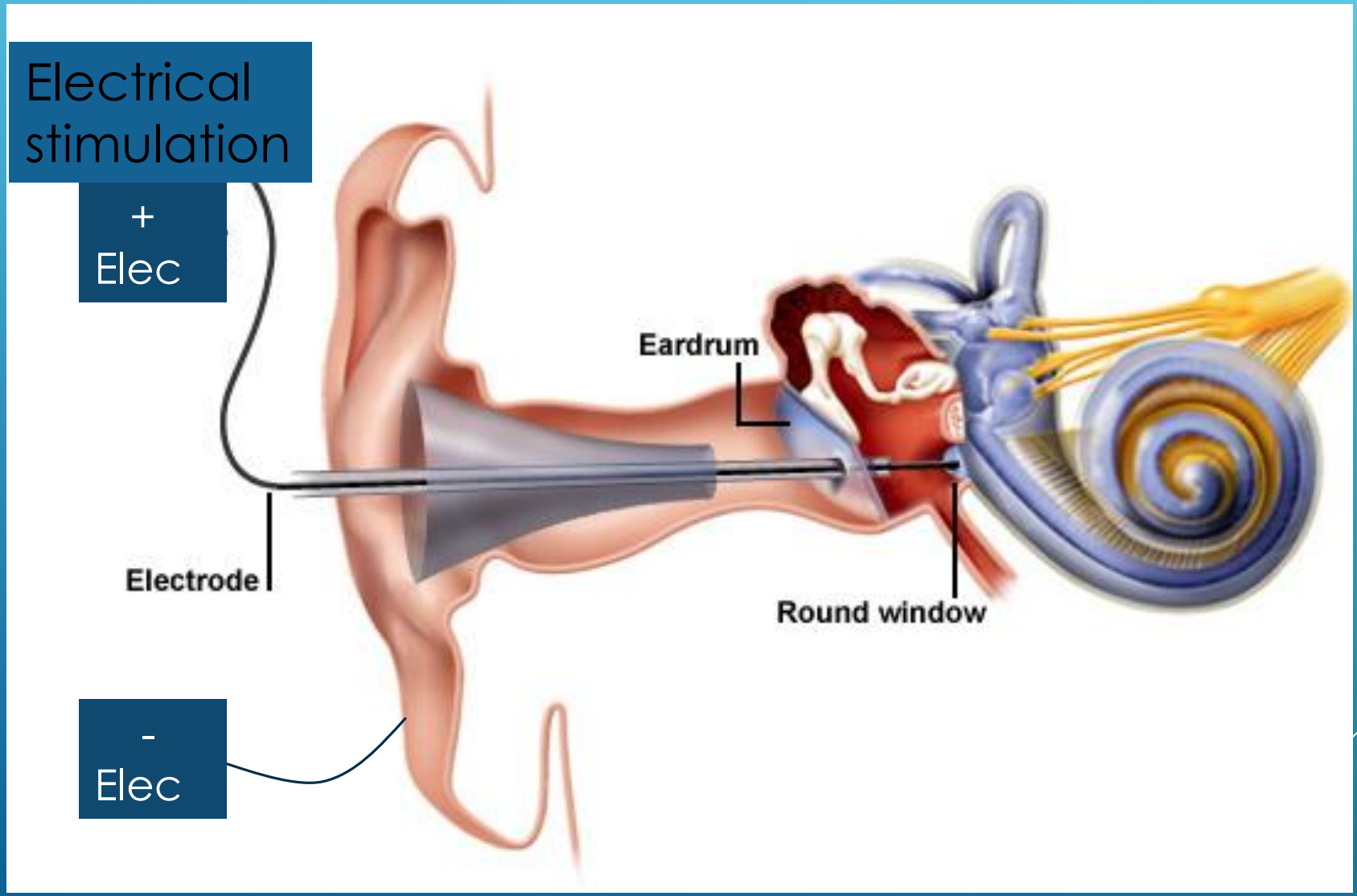
Audiologist

Components of the Auditory Pathway



The spiral ganglion houses the cell bodies of the first order neurones in the auditory pathway.




Electrical stimulation
+
Elec
Eardrum
Electrode
Round window
-
Elec

THR , MCL , ULL ,DR

THR Assessment of the patient's Stimulation threshold

MCL Most comfortable level

ULL uncomfortable level

DR Dynamic range is the difference of ULL & THR

*ALL three levels and the dynamic range are frequency - dependent

* The default frequencies are audiometer-frequencies

- The amplitude adjustment for each frequency has be done at least two times.
- If the difference of the last two amplitude values is larger than 10% of the last values, the adjustment has to be repeated until this condition is met.
- The test signal can be chosen to be sinus, square or biphasic pulses

- When working with children it is advantageous to use an intermittend stimulation.
- In most cases it is only possible, to get the threshold and sometimes the ULL

TDL THE TEMPORAL DIFFERENCE LIMEN TEST

The purpose of this test is to collect information about the patient's ability to discriminate tones of different duration.

This is done by stimulating the patient with a series of three signals of the same frequency whereby one of these tones is a little bit longer.

The patient's task is to identify the longer tone.

TEST ALGORITHM

At each trial three tones of the same frequency are presented .

Two tones are of same duration (200 ms), one tone is by the amount of TD longer.

This amount is called the temporal difference TD

The pause between the tones is 500ms

The patient has to recognize, which tone was the longer one

If correct answers TD is decreased by 20%

If wrong answers TD is increase by 20%

EVALUATION

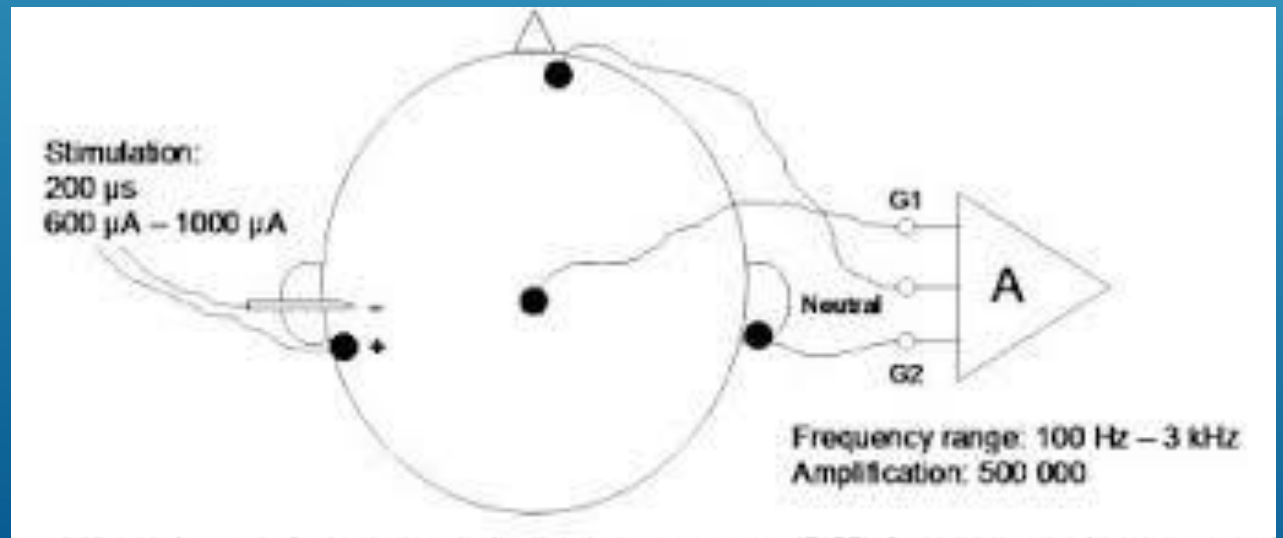
A Temporal –DL below 100-120ms is a prerequisite for speech understanding without lipreading and can be used for patient counselling .

It can, however, not guarantee visually unaided speech recognition.

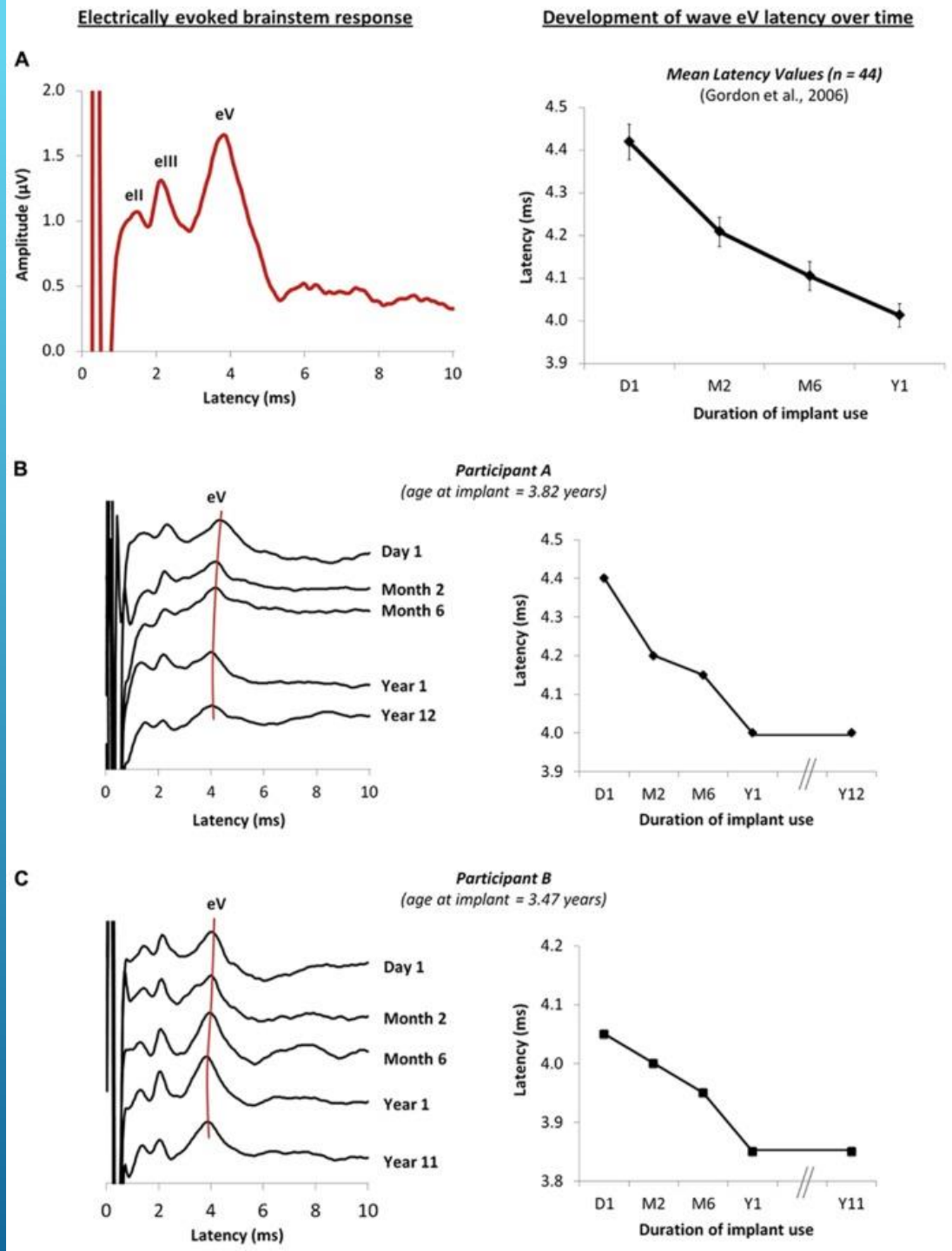
ELECTRIC BRAIN STEM AUDITORY RESPONSE (EABR) BEFORE COCHLEAR IMPLANTATION (CI)

Recording EABR waveforms, measuring the latency of Ⅱ, Ⅲ, Ⅳ, Ⅴ wave and the Ⅲ-Ⅴ interval, Ⅴ-wave amplitude.

The Ⅱ, Ⅲ, Ⅳ, Ⅴ waves are similar with the acoustic evoked ABR.



EXAMPLE OF AN ELECTRICALLY EVOKED AUDITORY BRAINSTEM RESPONSE



EABR (CONT,)

At 50 μs pulse electrical stimulation, the average threshold of V-wave was (156.37±21.44)CL,

The average dynamic range was (36.33±8.63)CL. 20 CL above the threshold,

Average latency of wave Ⅱ, Ⅲ, Ⅴ was (1.54±0.12)ms, (2.06±0.23)ms and (4.14±0.25)ms,

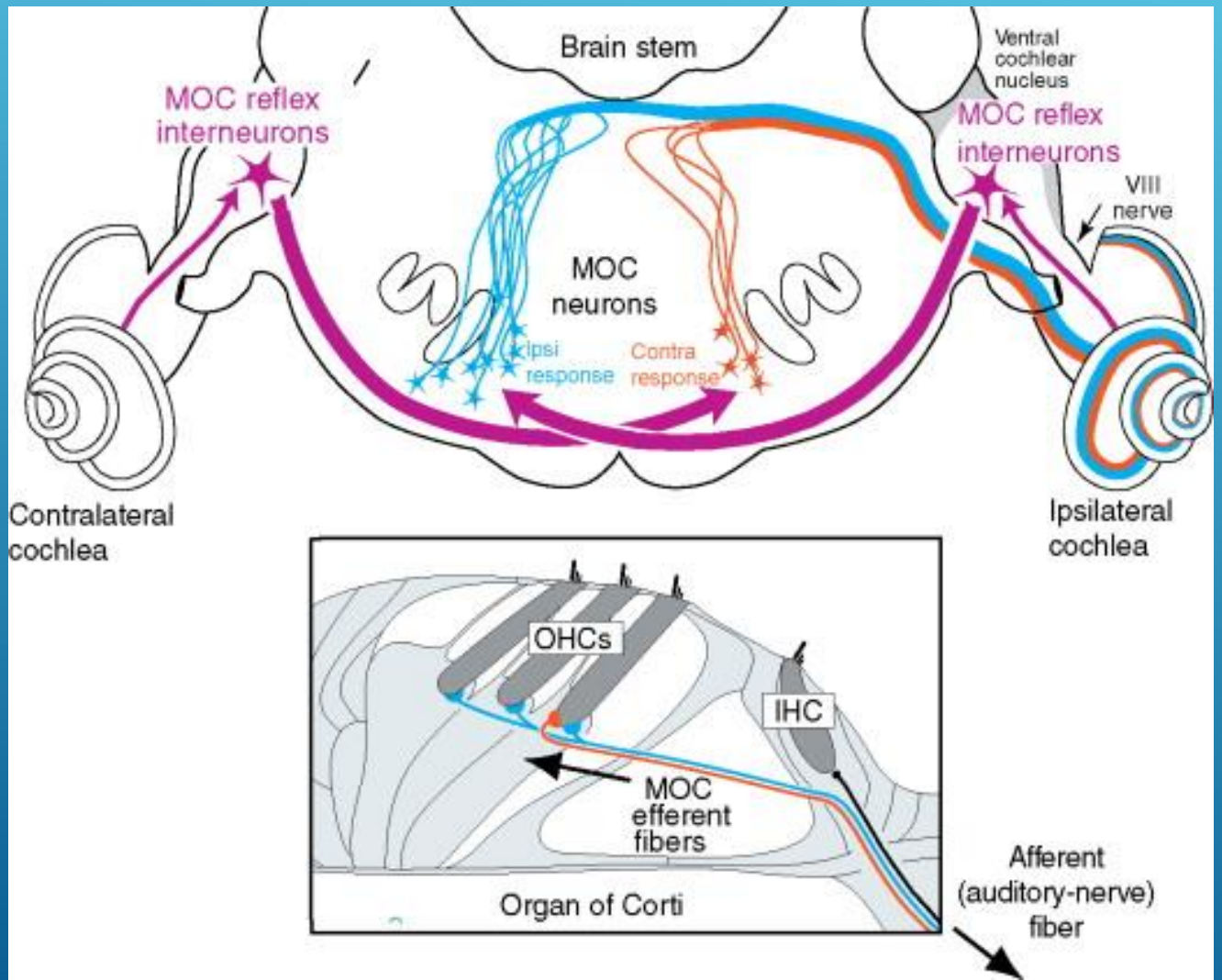
The Ⅲ-Ⅴ interval was (2.08±0.24)ms,

The average amplitude of Ⅴ-wave was (0.35±0.07)μV.

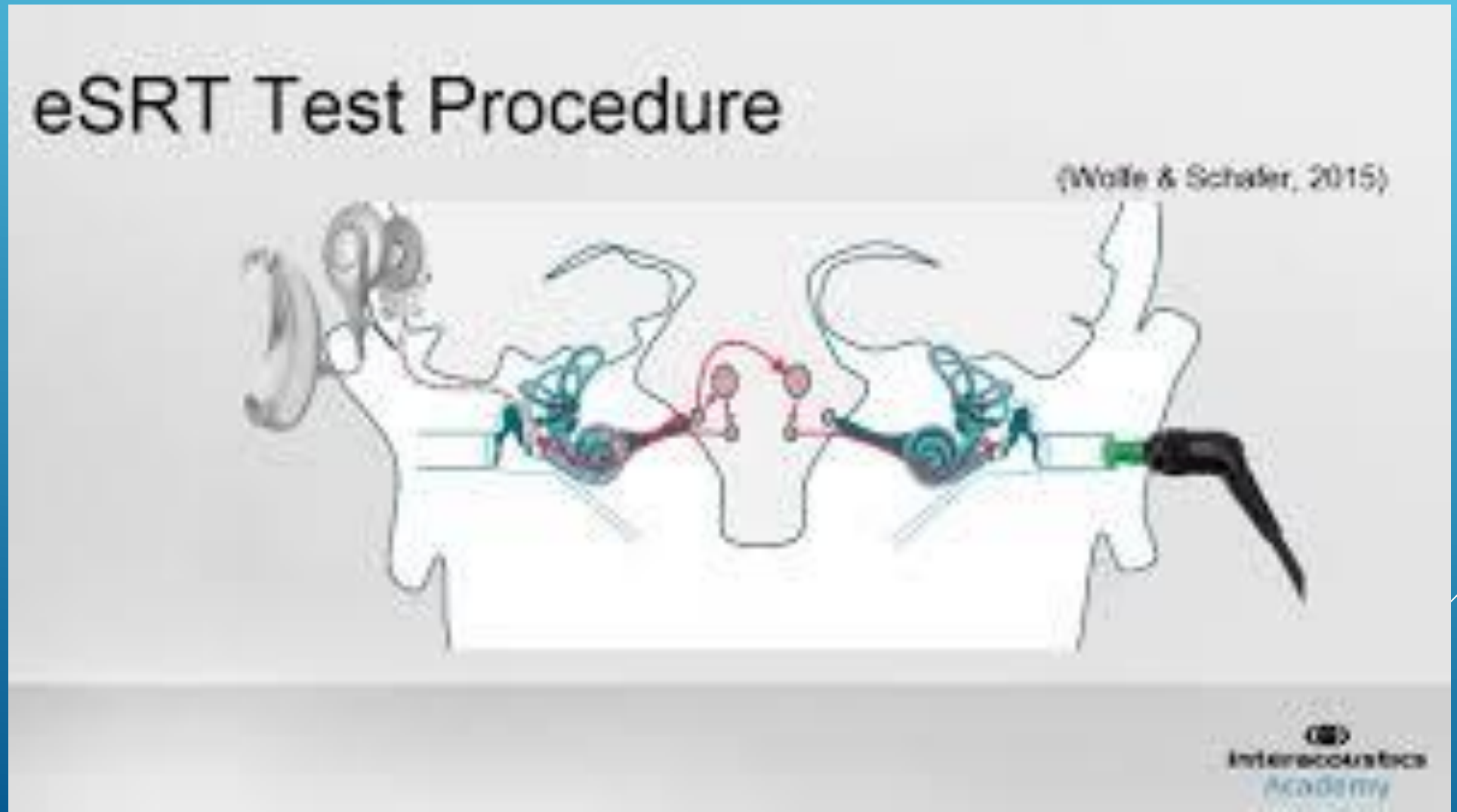
CONCLUSION

The EABR detection method is reliable, extraction rate is high. EABR can be used to evaluate the auditory pathway before inserting electrode, which could provide the help for the screening operative indications of CI.

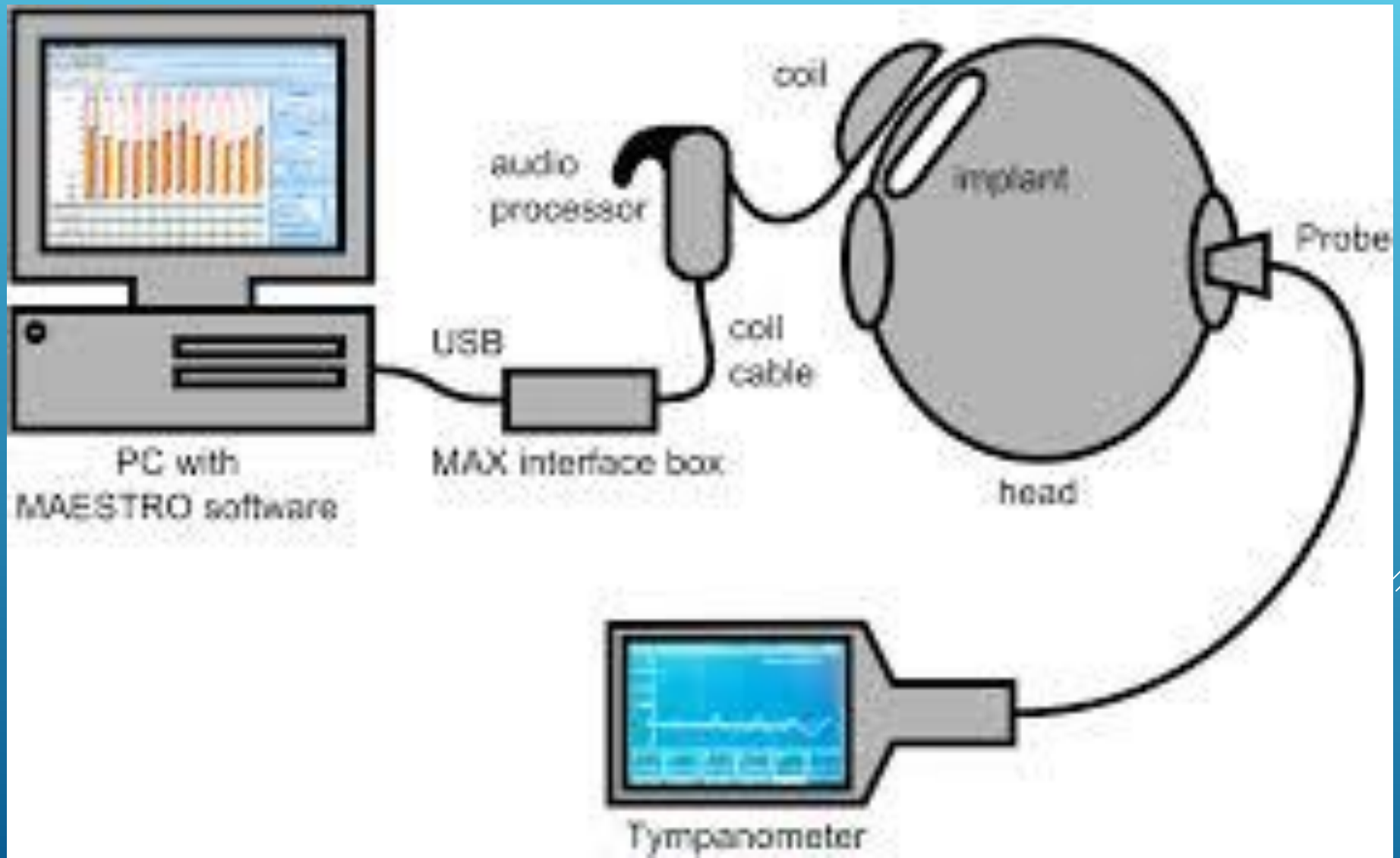
(ESRT) ELECTRICALLY EVOKED STAPEDIUS REFLEXES THERESHOLD



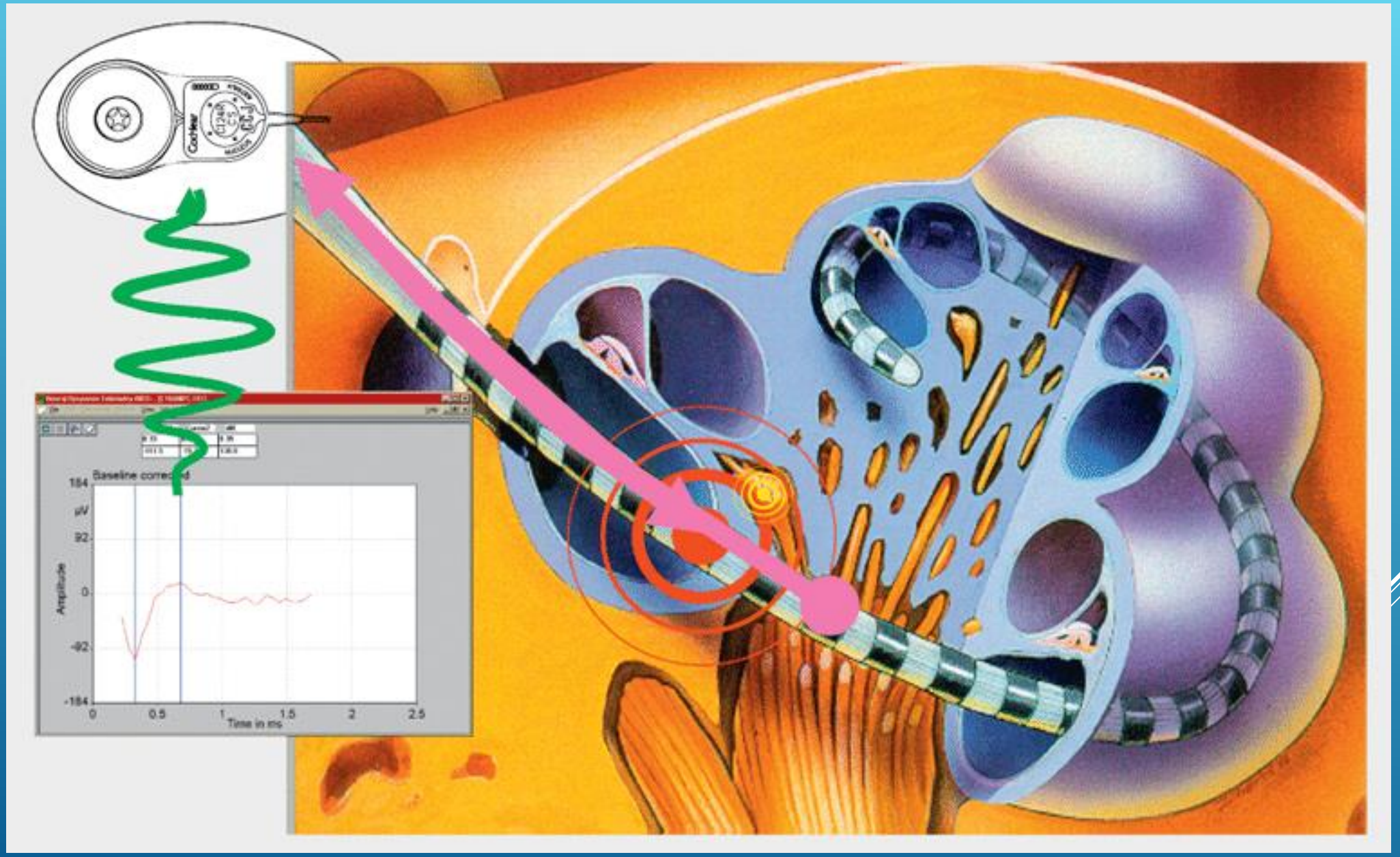
(ESRT)


eSRT Test Procedure
(Wolfe & Schafer, 2015)
Interacoustics
Academy

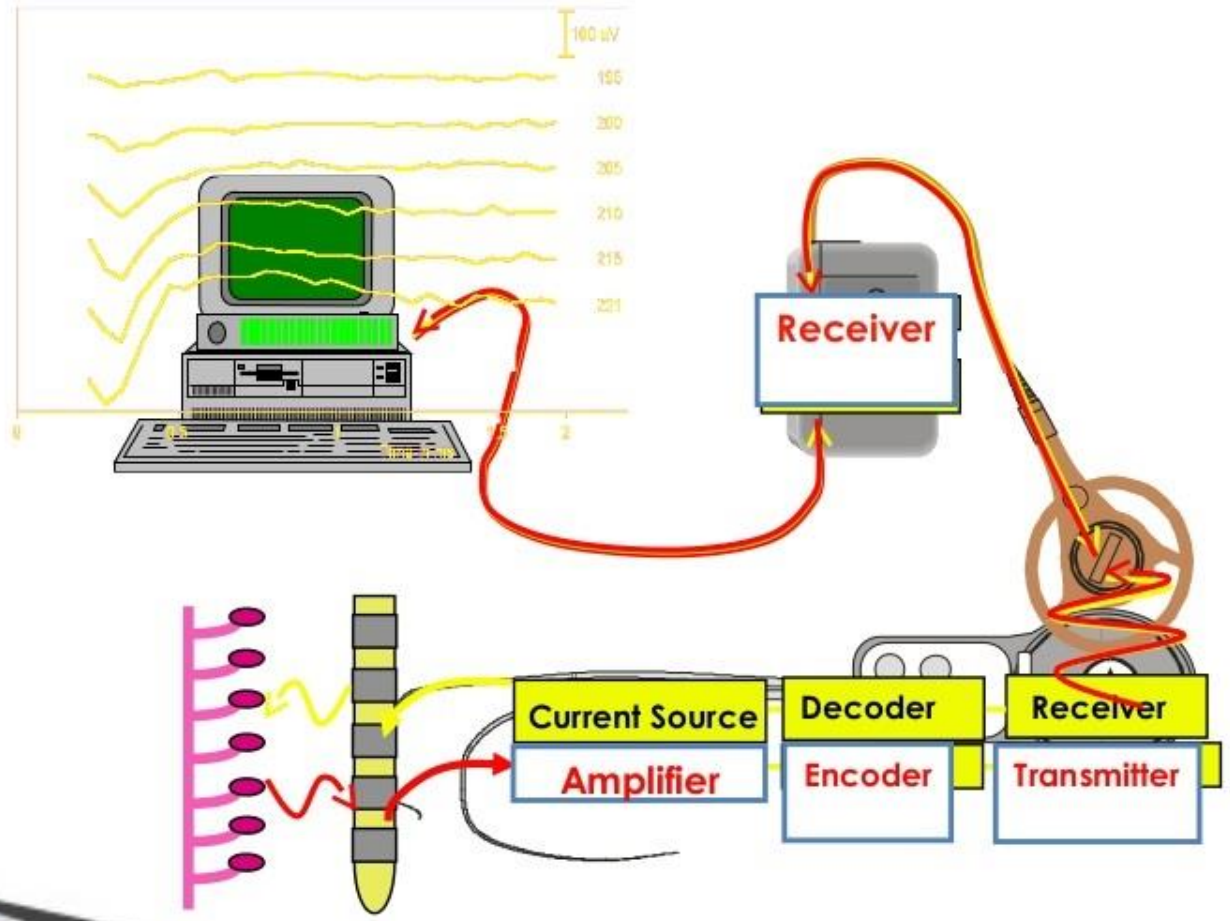
(ESRT)


coil
audio
processor
implant
Probe
USB
coil
cable
PC with
MAESTRO software
MAX interface box
head
Tympanometer

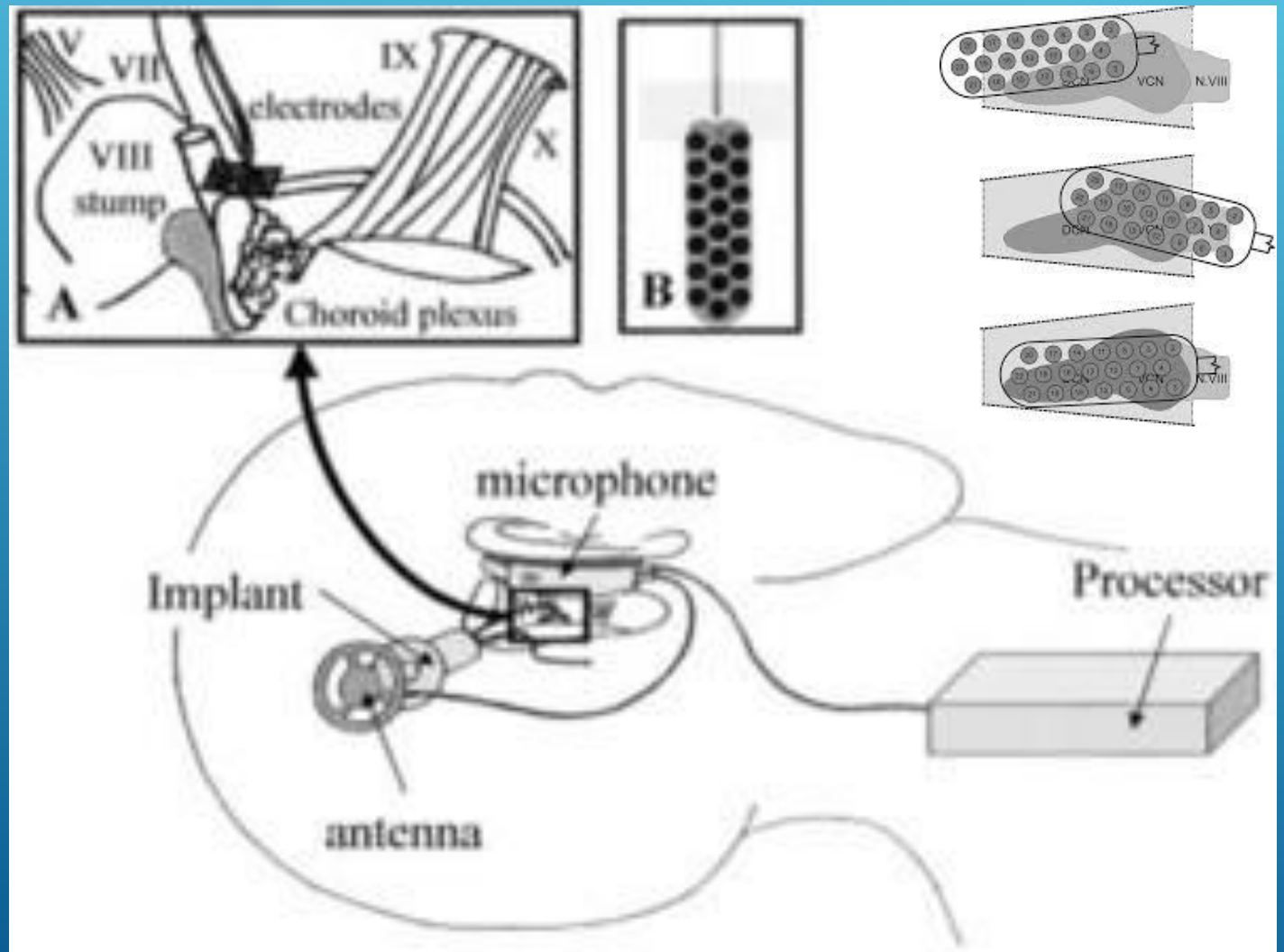
Neural response telemetry (NRT)

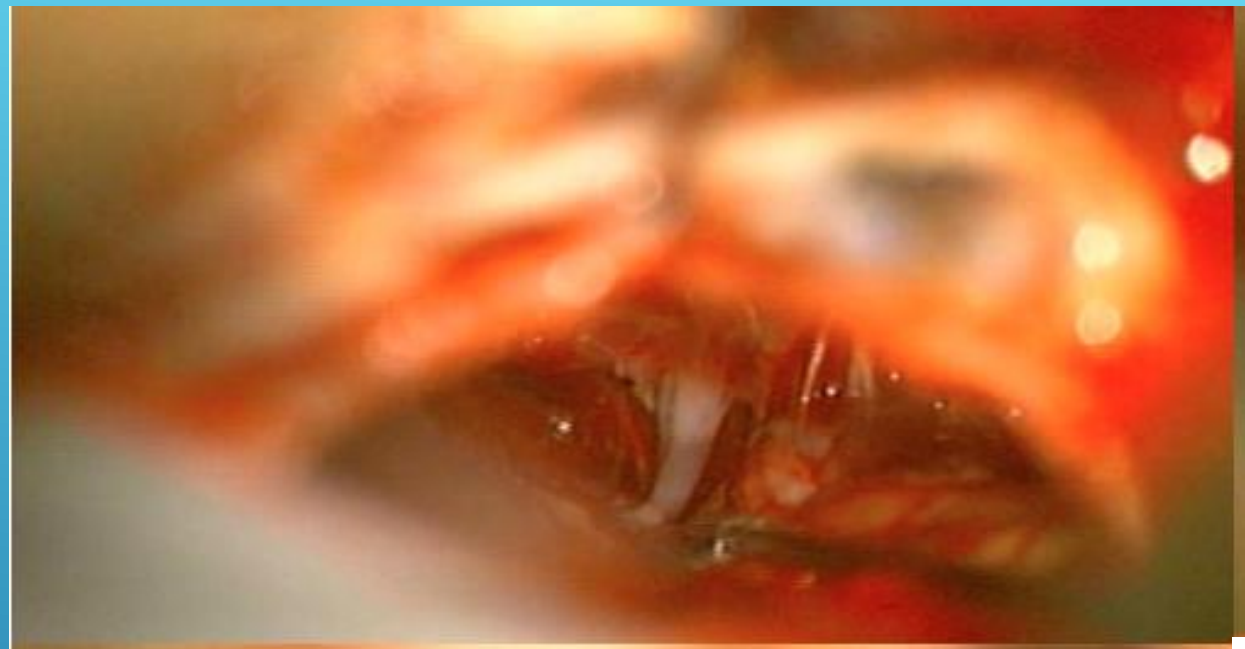
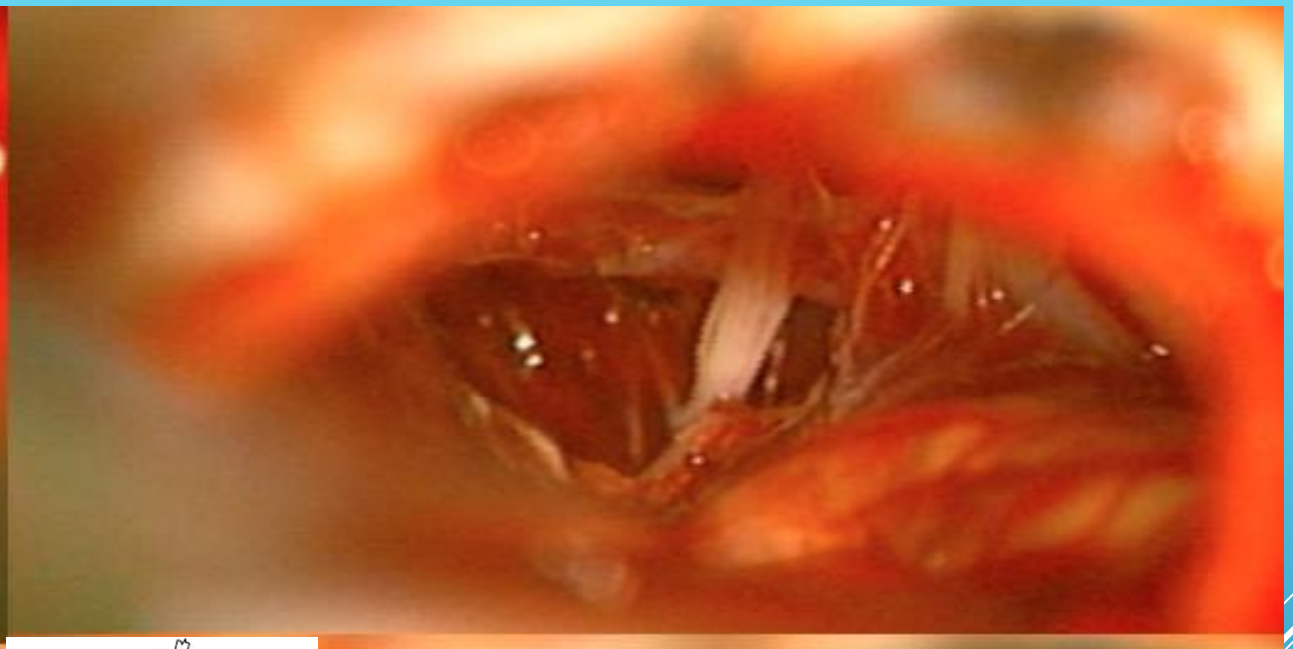
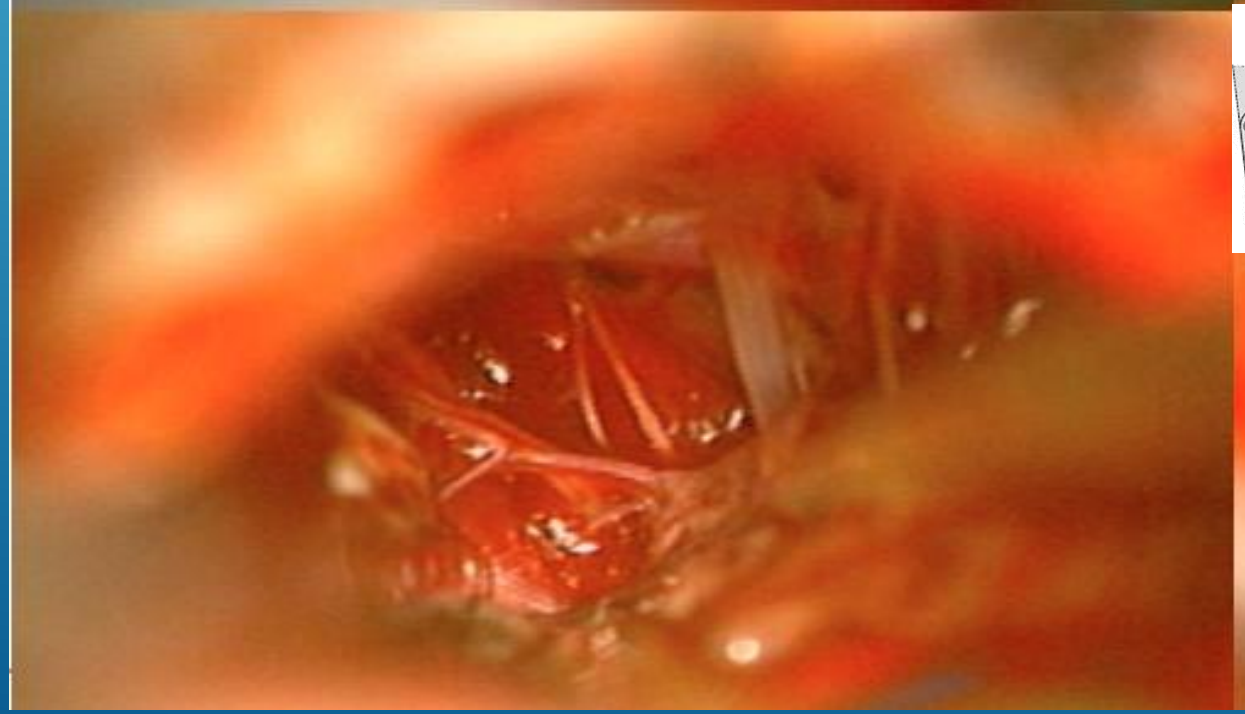


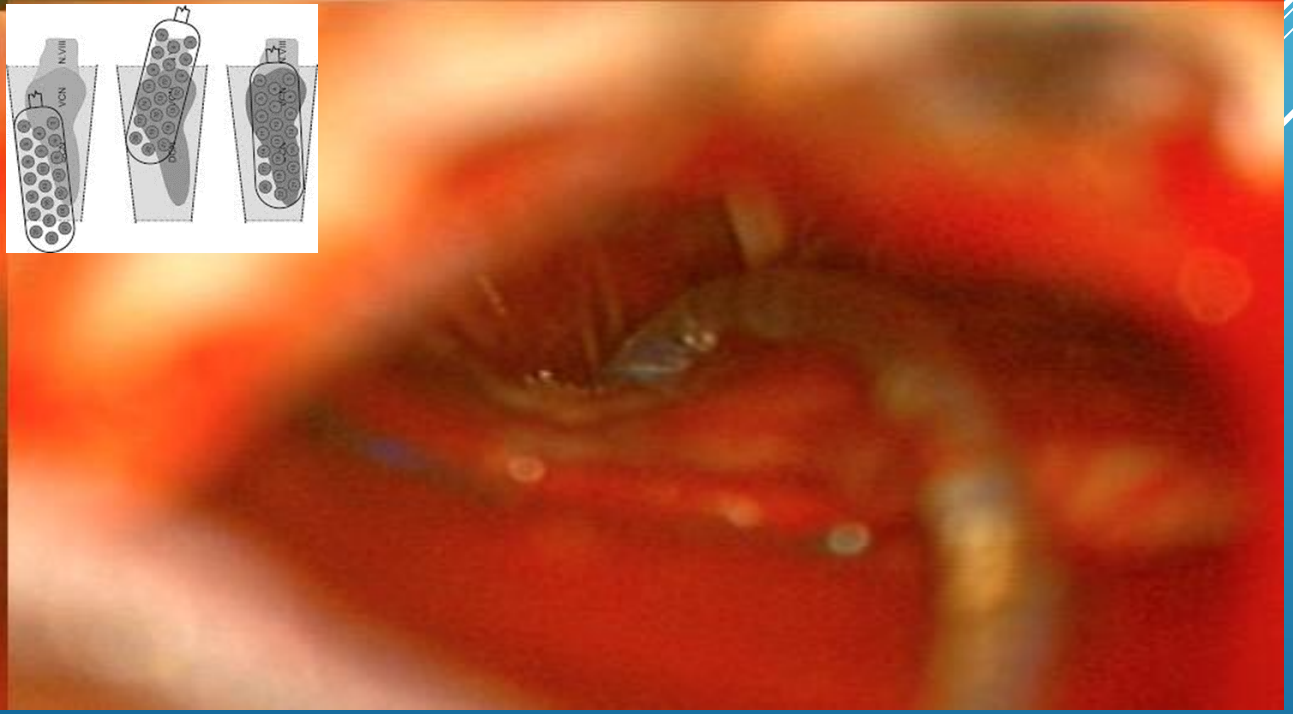
Neural Response Telemetry System



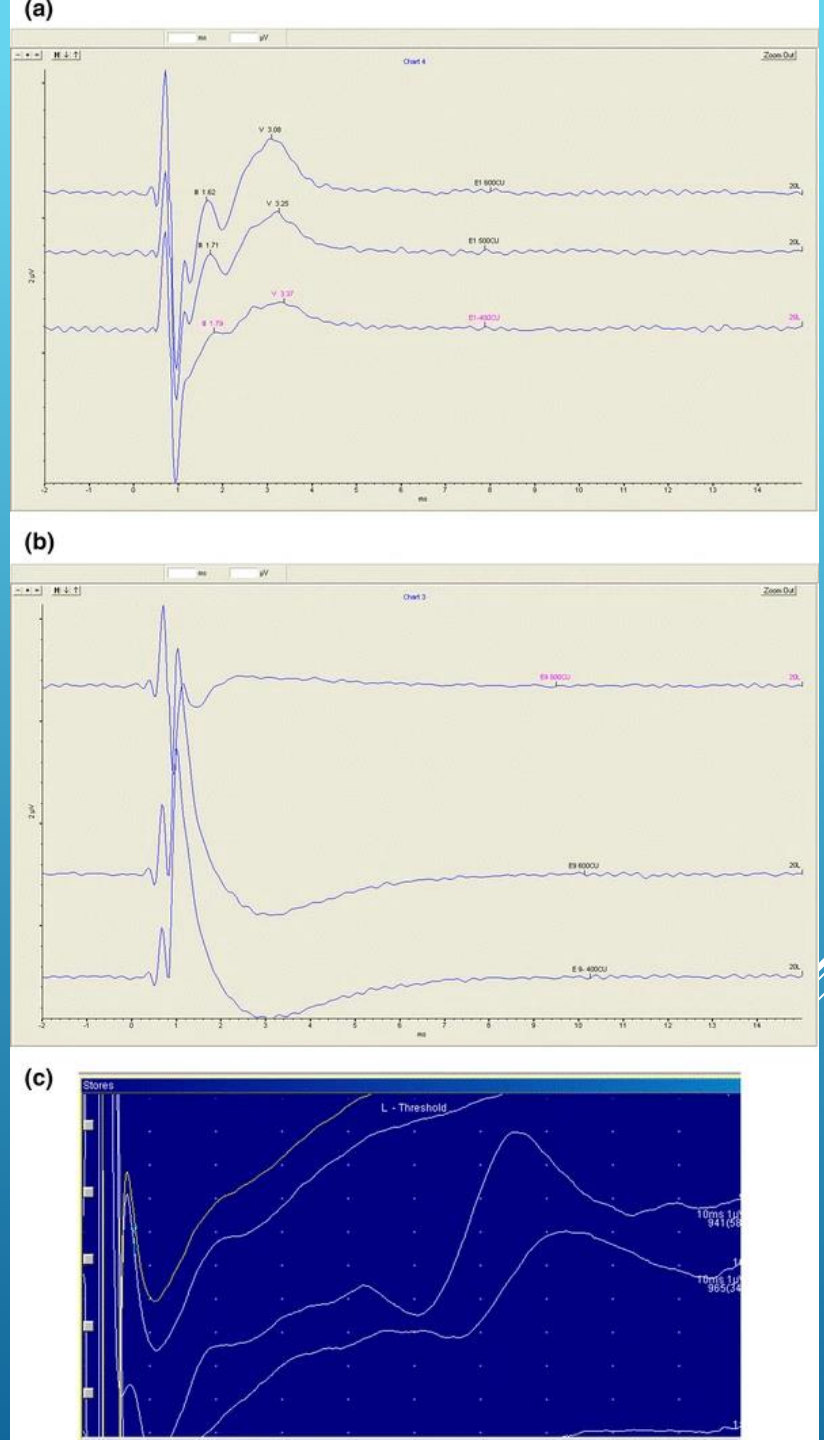
Intraoperative eABR



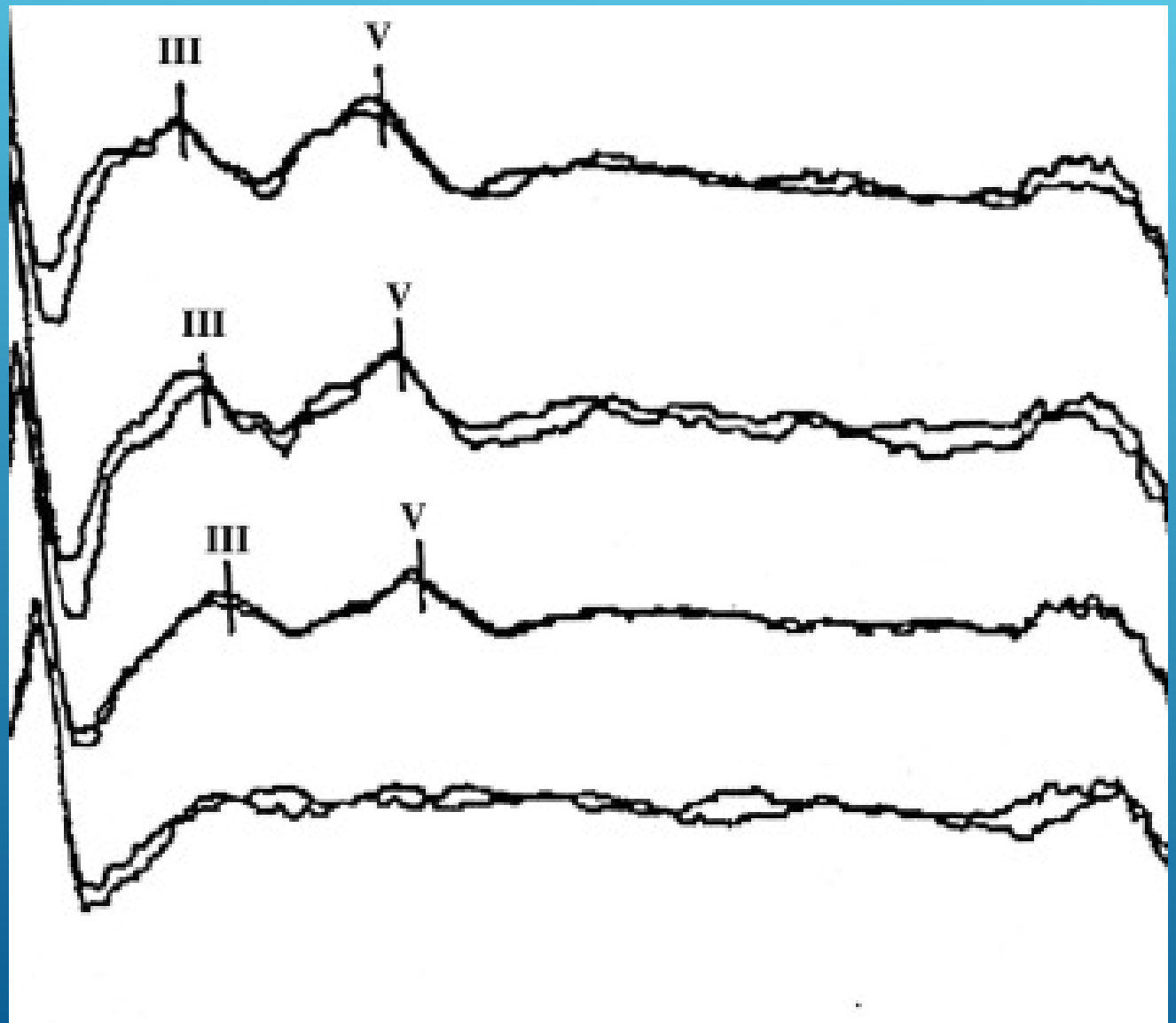




N.VIII
VCN
DCN
VCN
N.VIII


Intraoperative eABR findings. eABR images showing the III and Vth waves (**a**), no response (**b**), and myogenic activity indicating a future possible side effect (**c**)



EABR WAVES III AND V AT DIFFERENT CURRENT LEVELS DOWN TO THRESHOLD.



ABI RESULT