A Day in the Life (and brain) of an Intraoperative Monitoring (IOM) Professional

Kiara Ebinger, PhD, DABNM, FASNM

Hello!

I am Kiara Ebinger, PhD, DABNM

I am here because I love the fields of Audiology and IOM, and I want to introduce it to smart young professionals (like yourselves!!).

You can find me at kiara.ebinger@rtnassociates.com.

Outline

1. What is IOM?

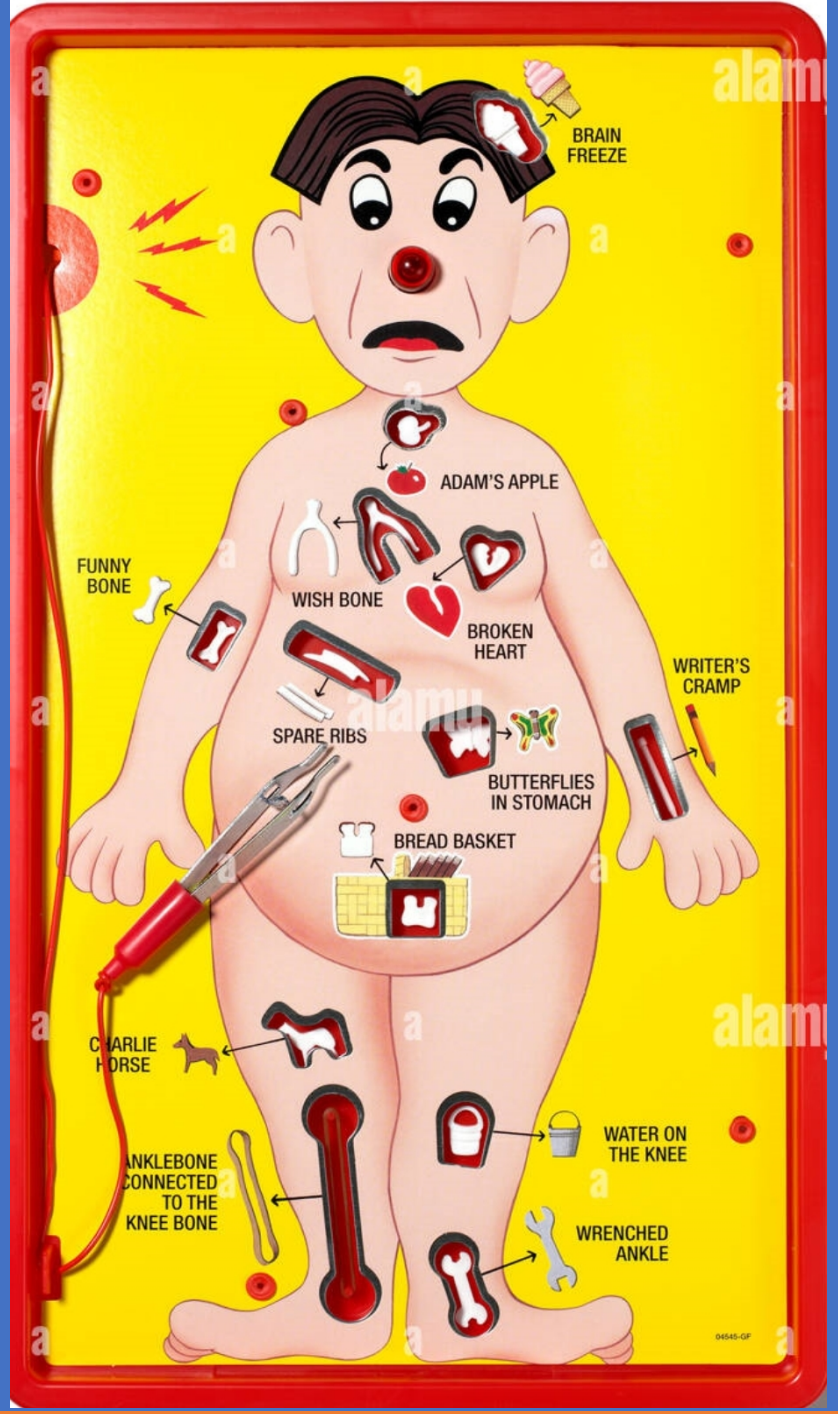
2. A Day in the Life
    a. Daily routine

3. Case Presentation
    a. Brain power

4. Why Audiology and IOM?

1. What is IOM?

Let’s start with the first set of slides



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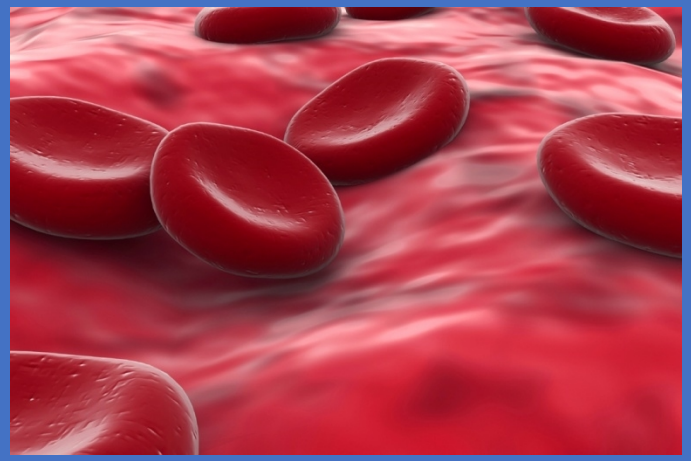
What is Intraoperative Neurophysiological Monitoring (IOM)?

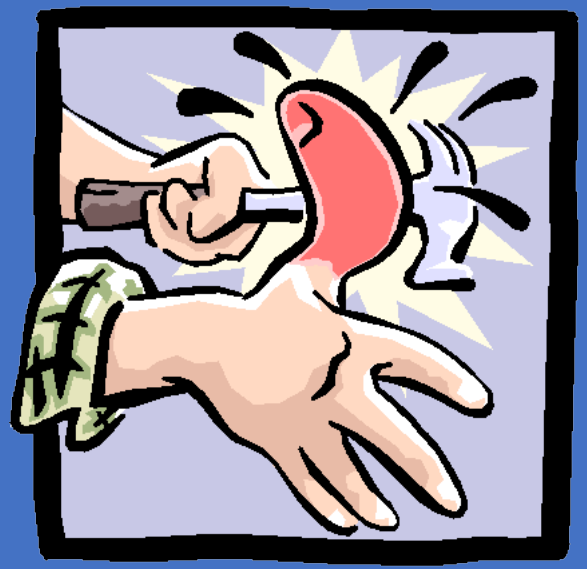
- Electrophysiological testing during surgeries that put the nervous system at risk
- Multiple tests (or “modalities”)
  - Based on structures at risk
- Each patient is their own baseline, and we look for intraoperative changes from that baseline
- Interventions can be performed to reduce or avoid permanent neurological damage

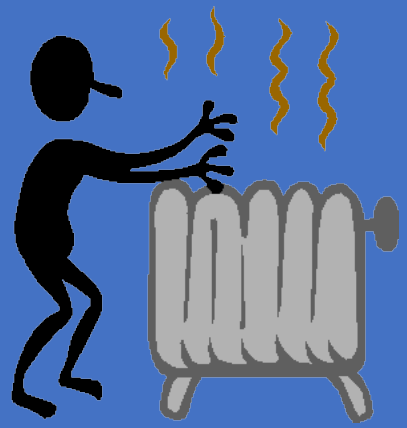
- **The earlier the intervention, the lower the likelihood of permanent neural damage**

Primary Surgical Causes of Neural Injury

- Ischemia
- Mechanical injury
- Thermal injury



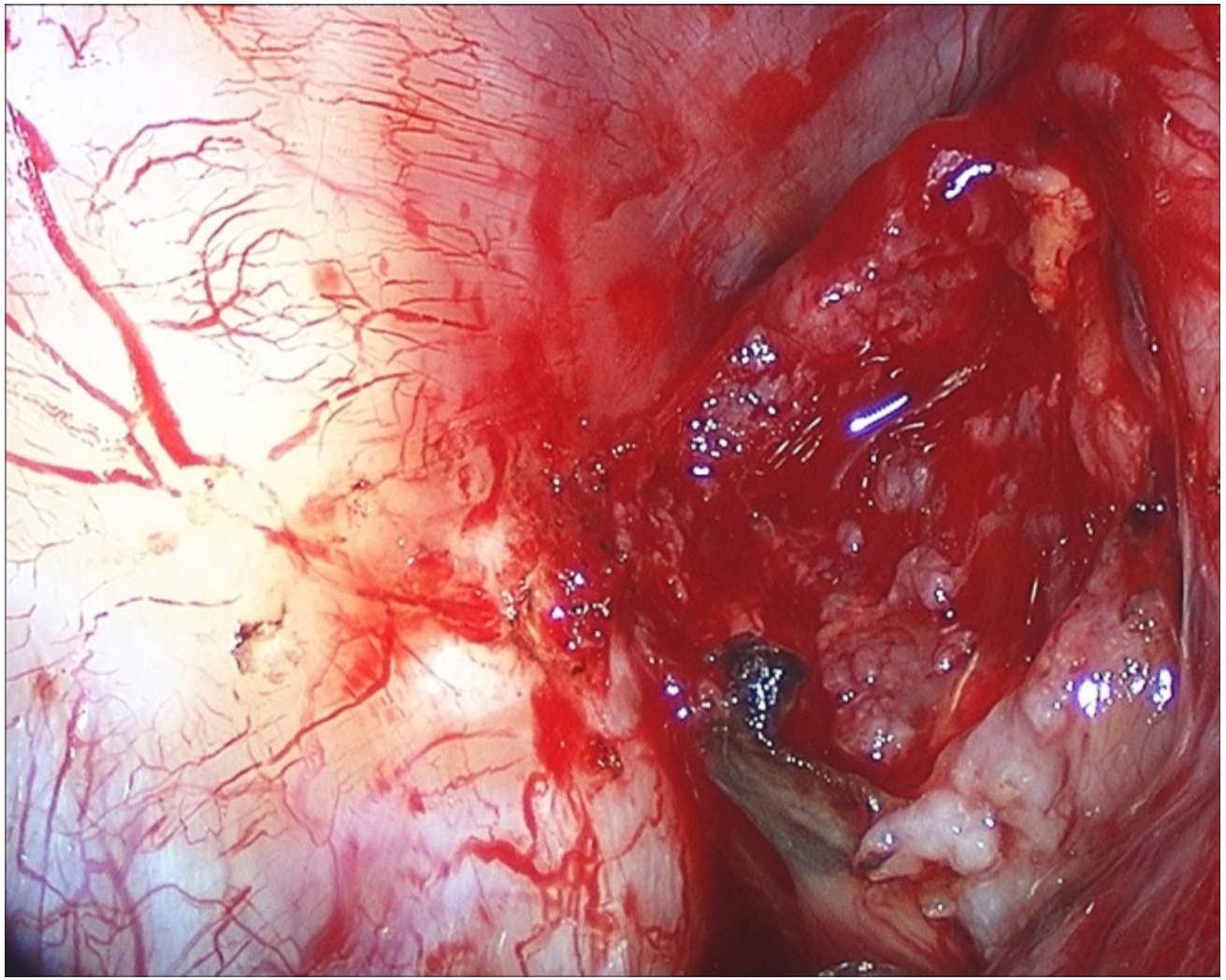




Primary Goal of IOM

- Prevention of surgically-induced damage to the nervous system

- Testing that is done on patients during surgery to preserve the integrity of the nervous system
- Testing that is performed to help guide the surgeon (for example, locating certain structures)



Can you find the facial nerve?

Types of Surgeries Monitored

- Spine (cervical, thoracic, lumbar)
- Tumor removal
- ENT procedures
- Deep brain stimulation for Parkinson’s
- Brain mapping
- Aneurysms
- Cardiovascular
- Joint replacements
- Any surgery in which part of the nervous system is at risk

2. A Day in the Life…

Let’s start with the first set of slides

WAKE UP!

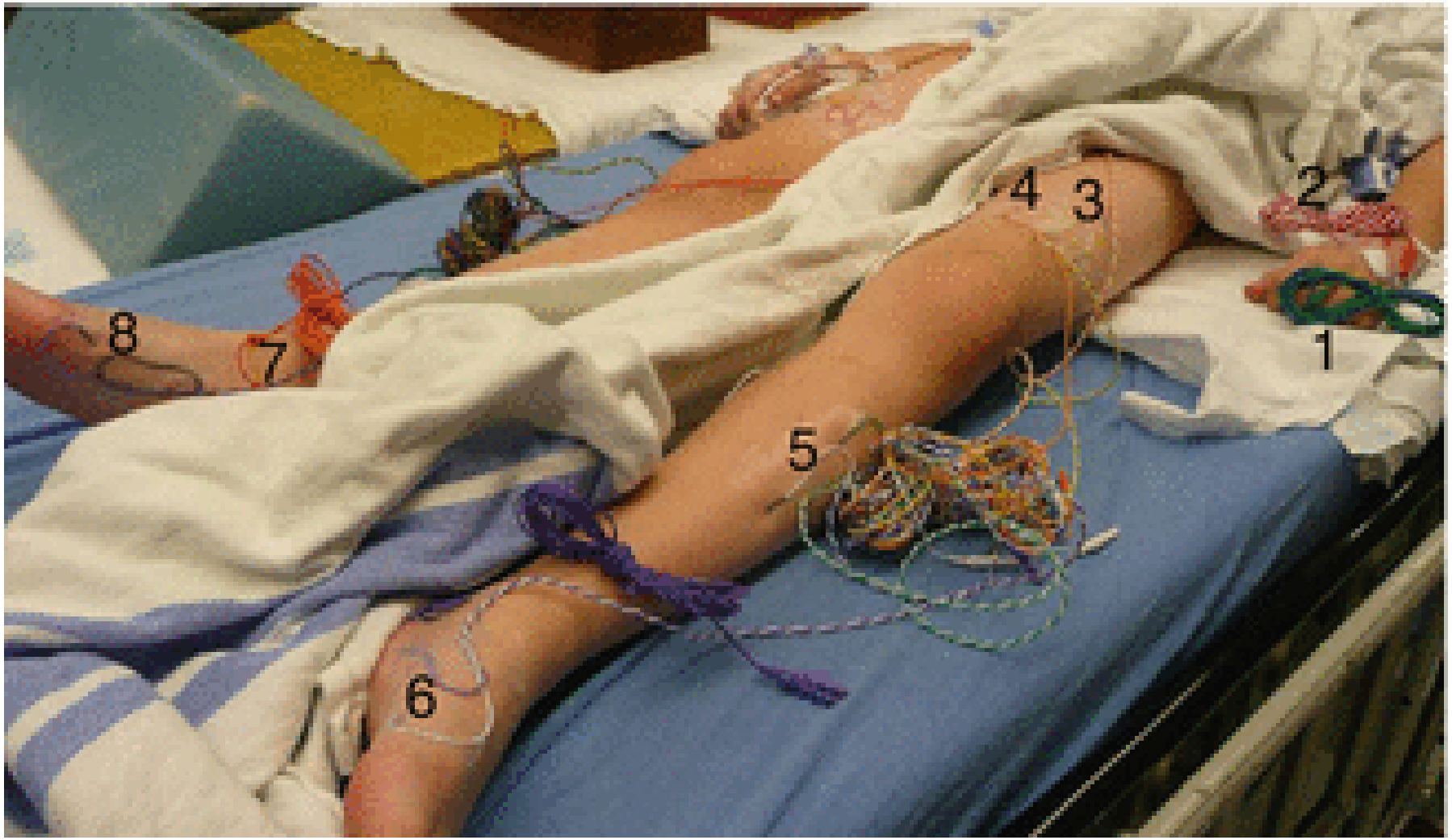
Meet and Prepare the Patient

- Get relevant patient history
- Explain intraoperative monitoring, procedure, risks and benefits
- Apply some electrodes
- Formulate the monitoring plan (this should start the previous evening)
  - What is the surgery?
  - What structures are at risk, and during which portions of the surgery?
  - What testing do I need to do to protect those structures?
  - What patient factors do I need to consider? (Age, body habitus, other medical conditions, pre-existing deficits, etc.)

Patient Arrives in the Operating Room

- Notify the online neurologist
- Set up the patient
- Apply remaining stimulating and recording electrodes
- Check impedances
- Run baselines
  - Troubleshoot any issues or poor data

Patient Set Up for IOM



In the OR

During the Case…

- It’s cold! And you get hungry and thirsty!
- Test continuously throughout the procedure
  - Watch every single trace!
- Instant message with the remote neurologist throughout
- Monitor and chart what the surgeon is doing
- Monitor and chart anesthesia levels, patient vital signs, anything relevant to the patient or procedure

When the Case Is Over…

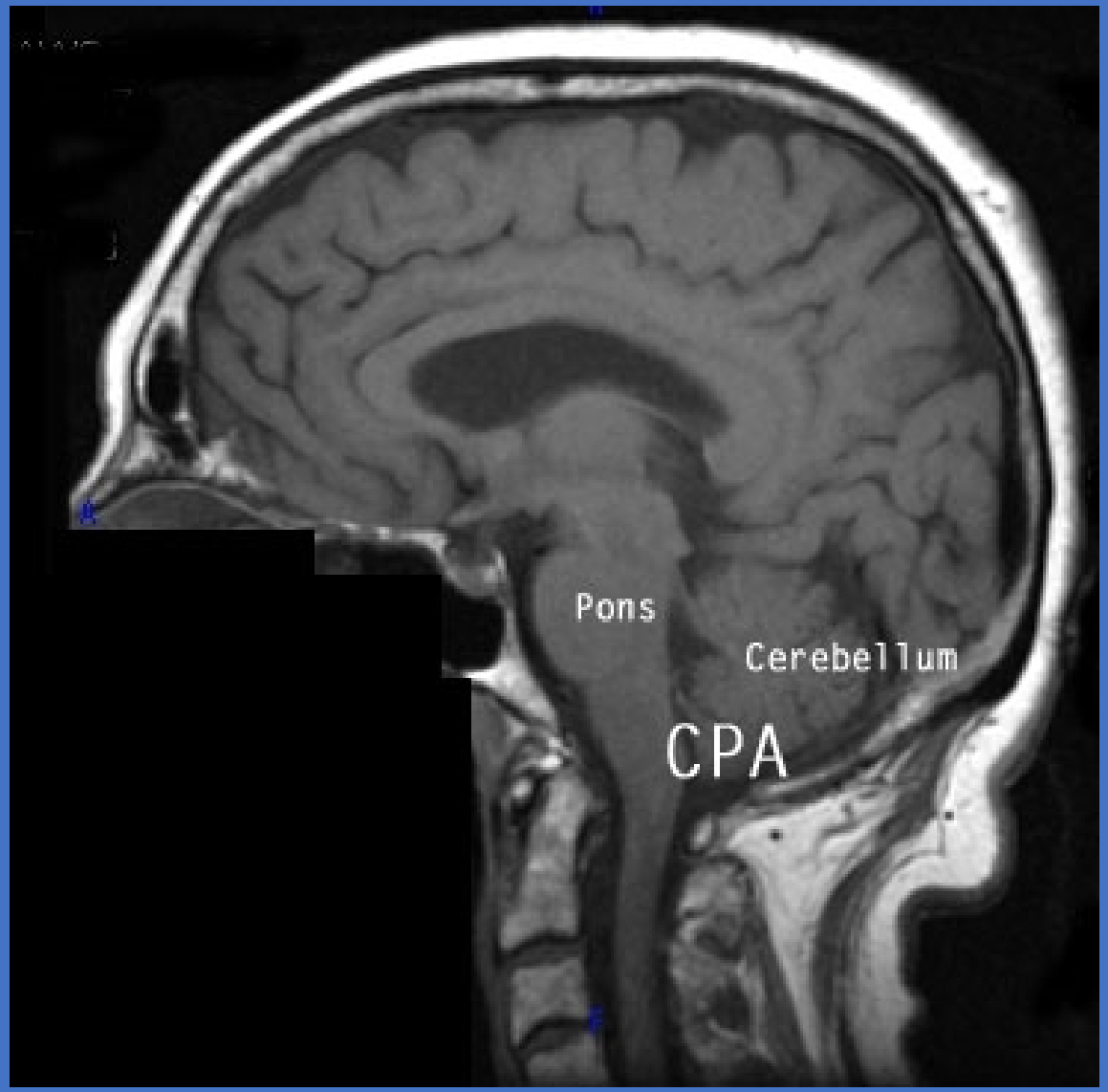
- Disconnect the patient
- Disinfect equipment
- Pack up equipment and supplies (unless there is another case to follow)
- Complete the report
- Perform neuro exam on the patient in the recovery room

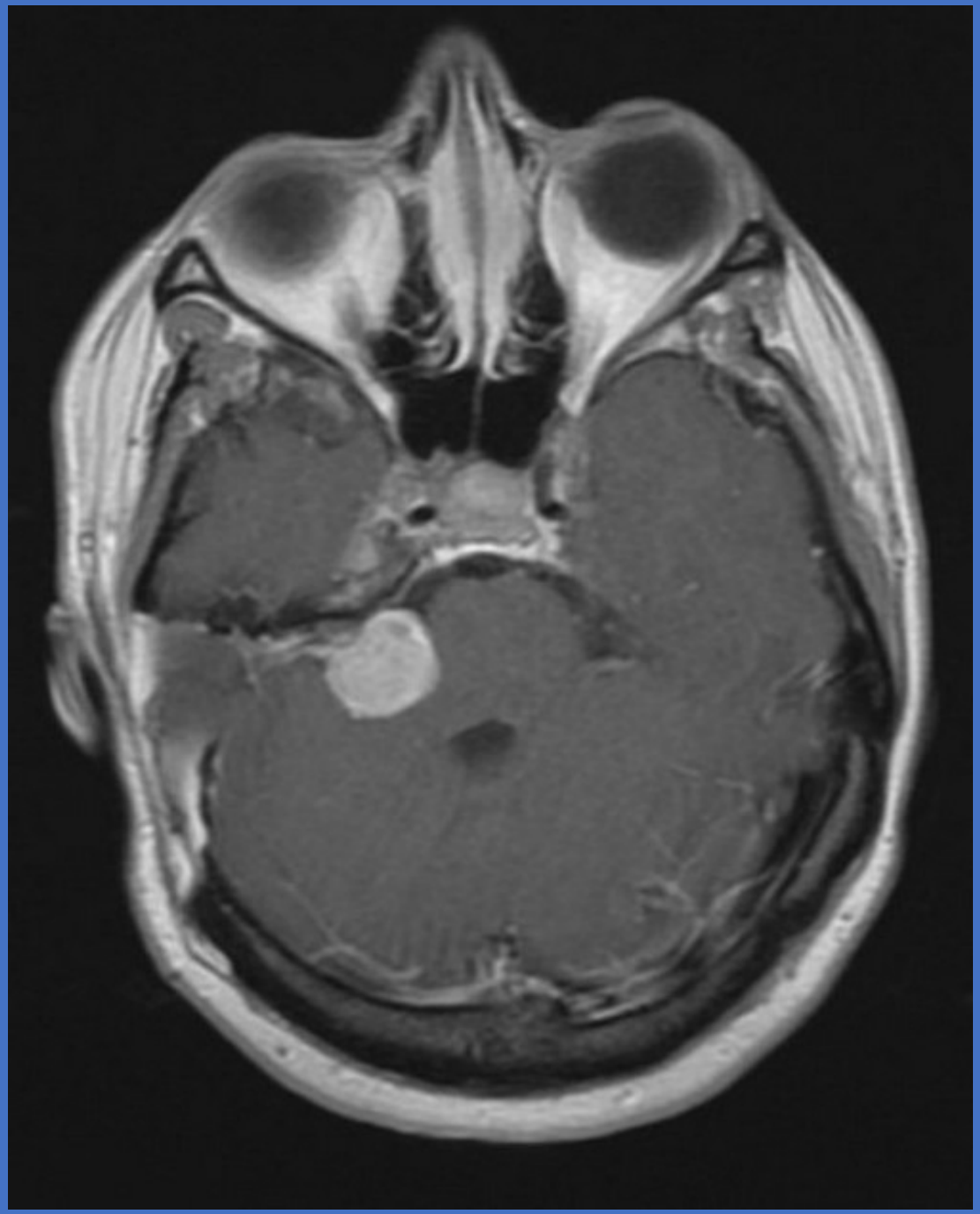
3. Case Presentation

Let’s start with the first set of slides

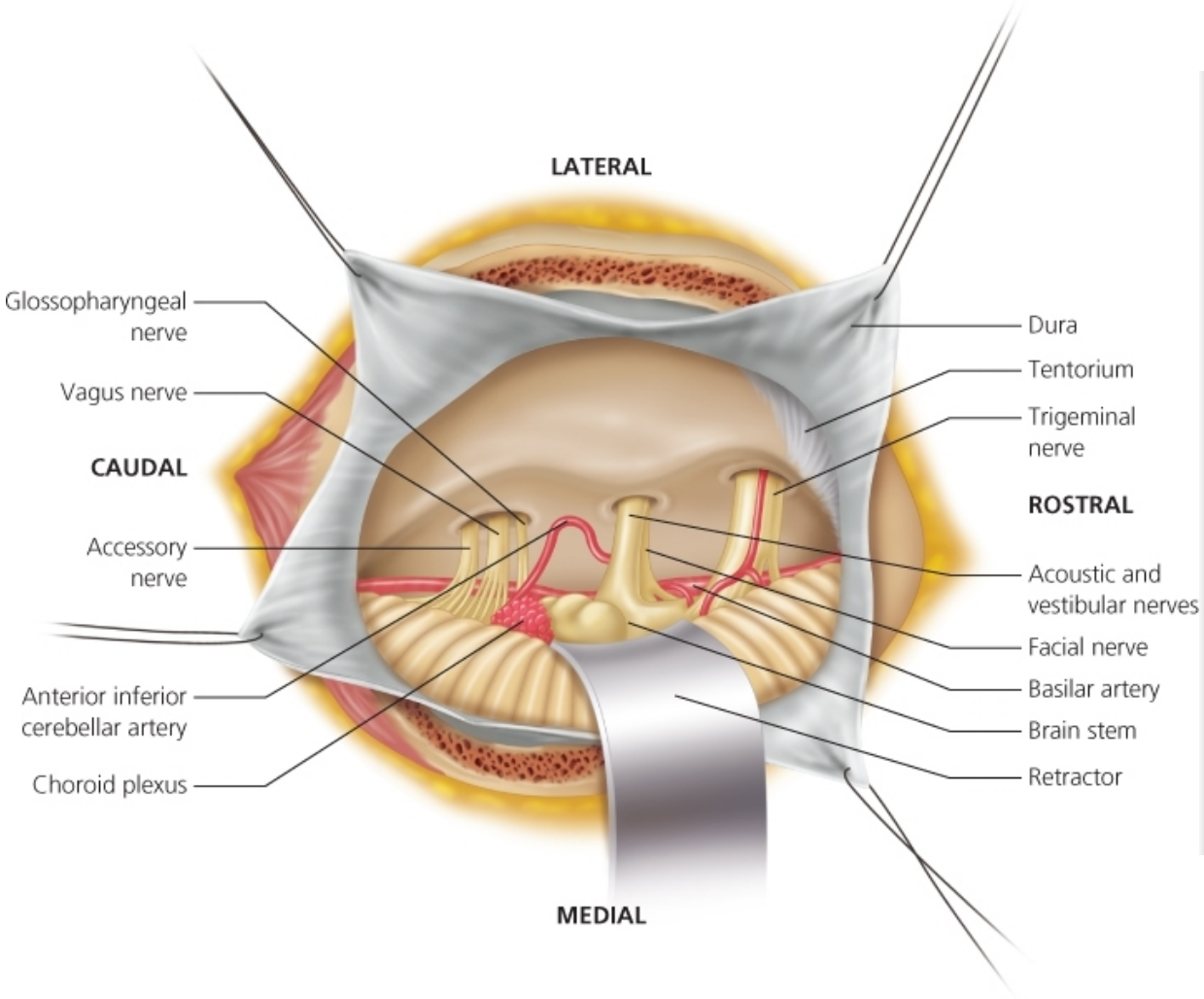
Patient:

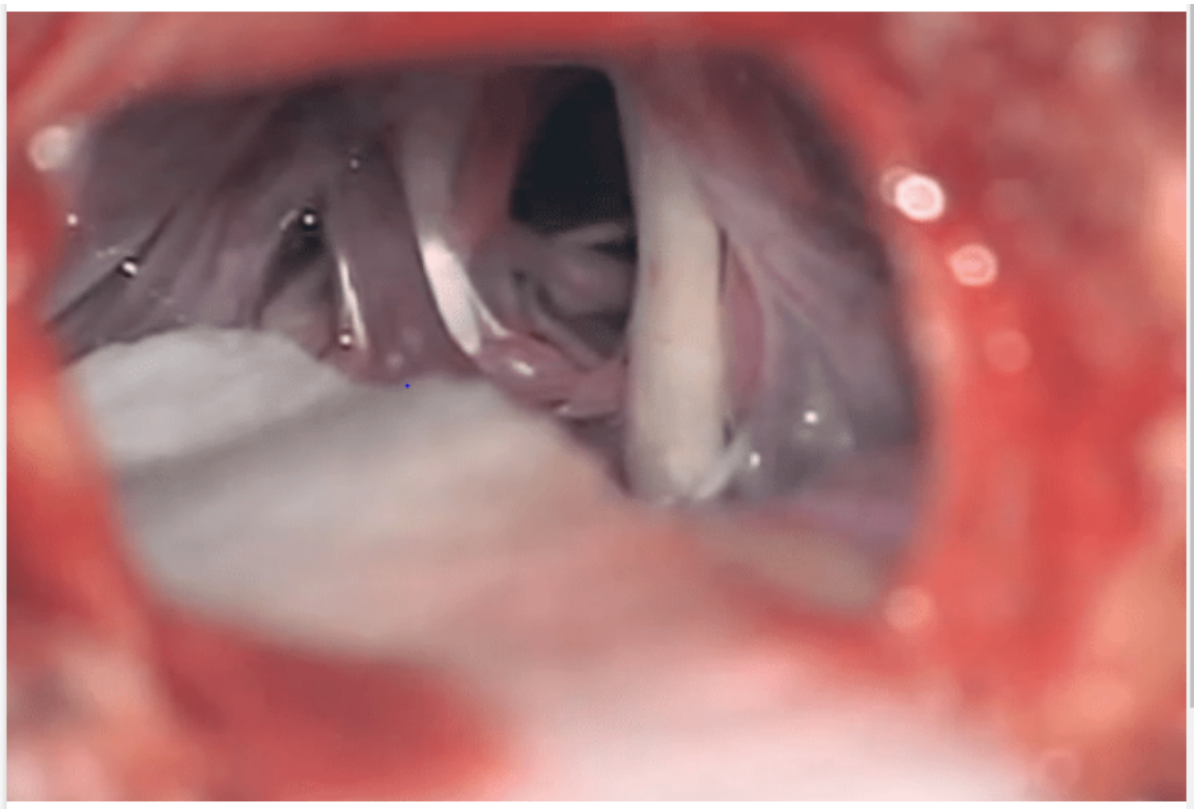
- 11-year-old male
- Left cerebellopontine angle (CPA) mass (1.2 x 1.4 cm, growing rapidly)
  - Surgical pathology report: JPA (Juvenile Pilocytic Astrocytoma)
- No significant preoperative deficits (hearing, sensory, motor)


Pons
Cerebellum
CPA



CPA Surgical Anatomy

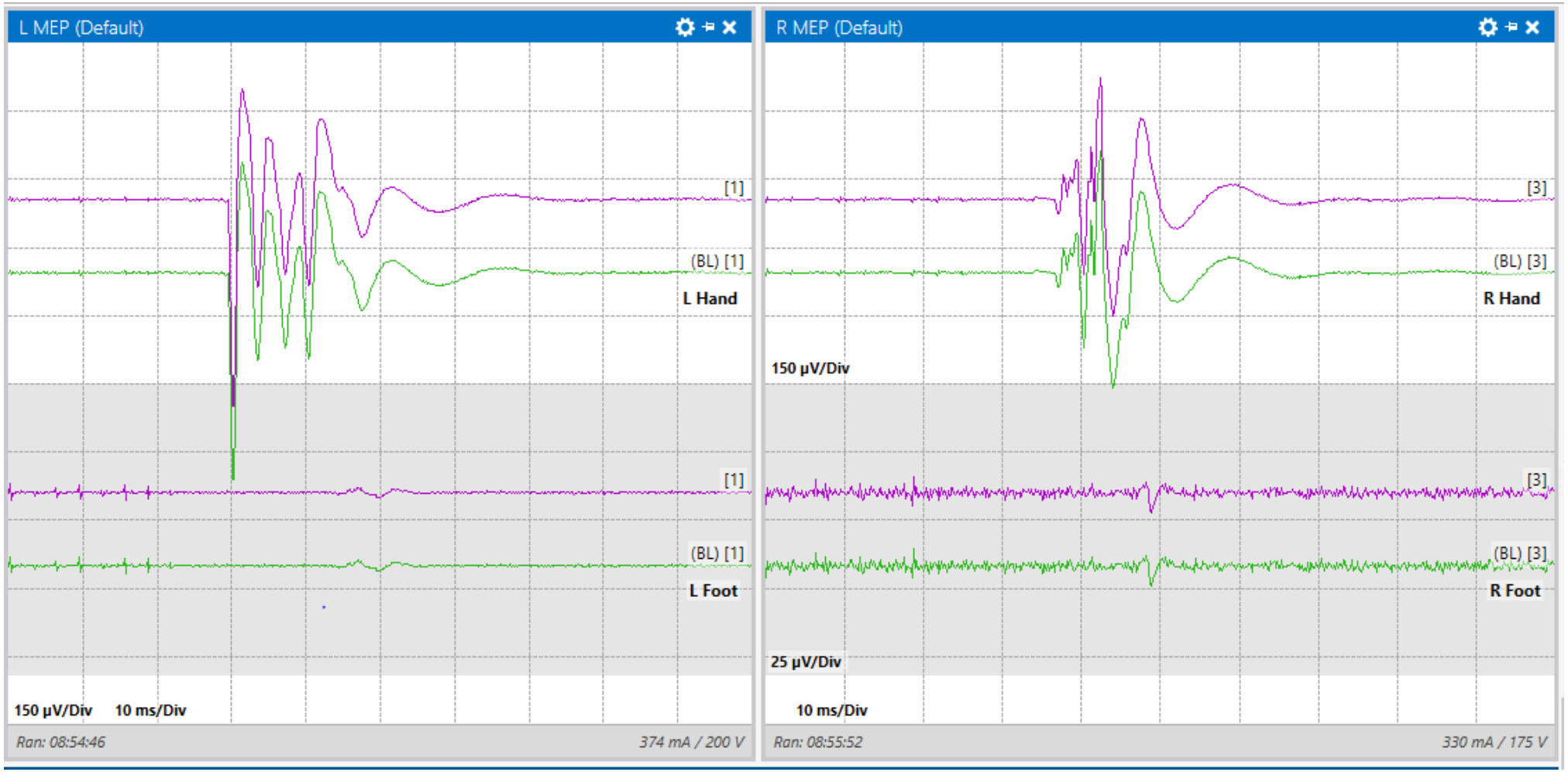




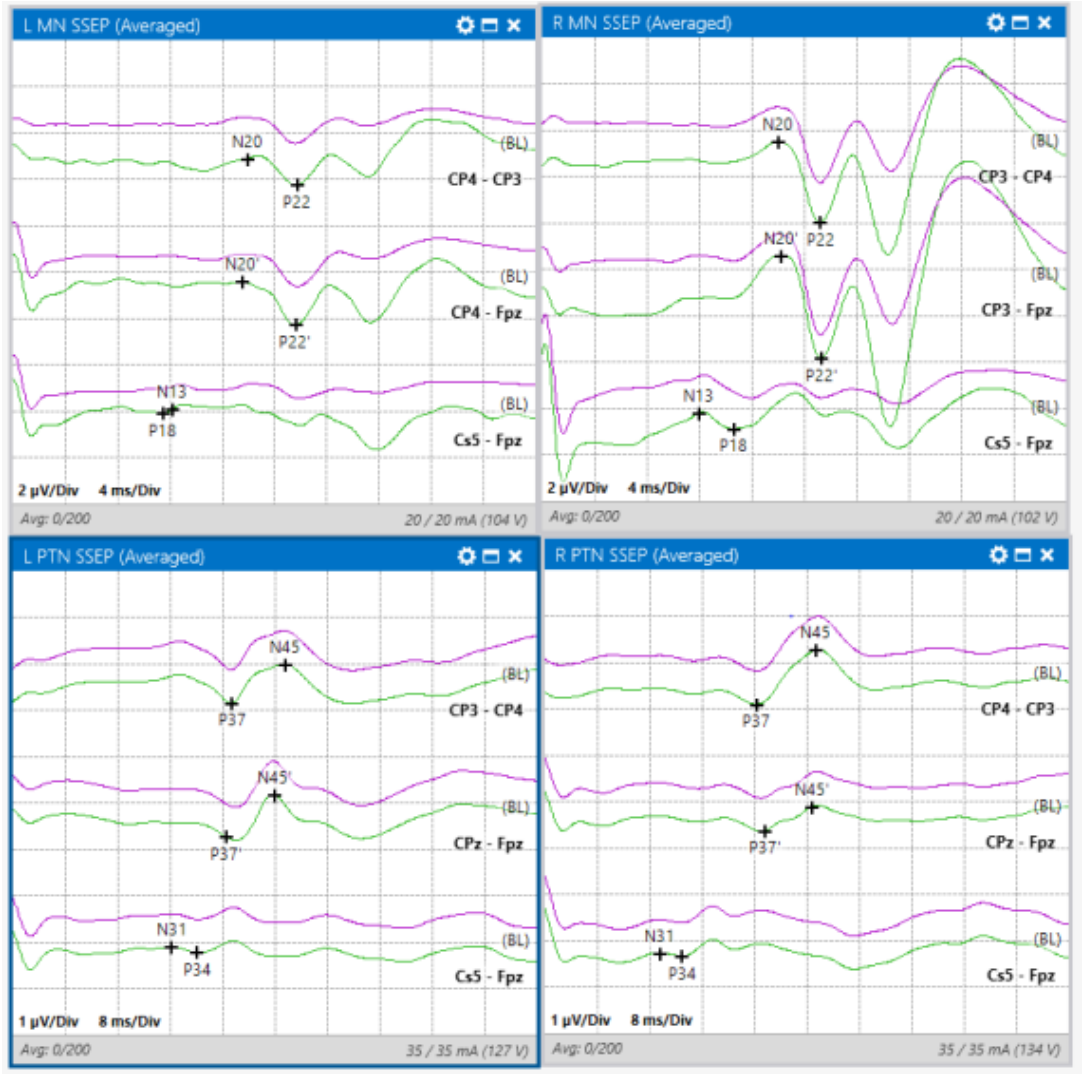
Intraoperative Monitoring Plan

- Transcranial Motor Evoked Potentials (TcMEPs)
- Somatosensory Evoked Potentials (SSEPs)
- Electromyography (EMG)
- Auditory Brainstem Responses (ABRs)

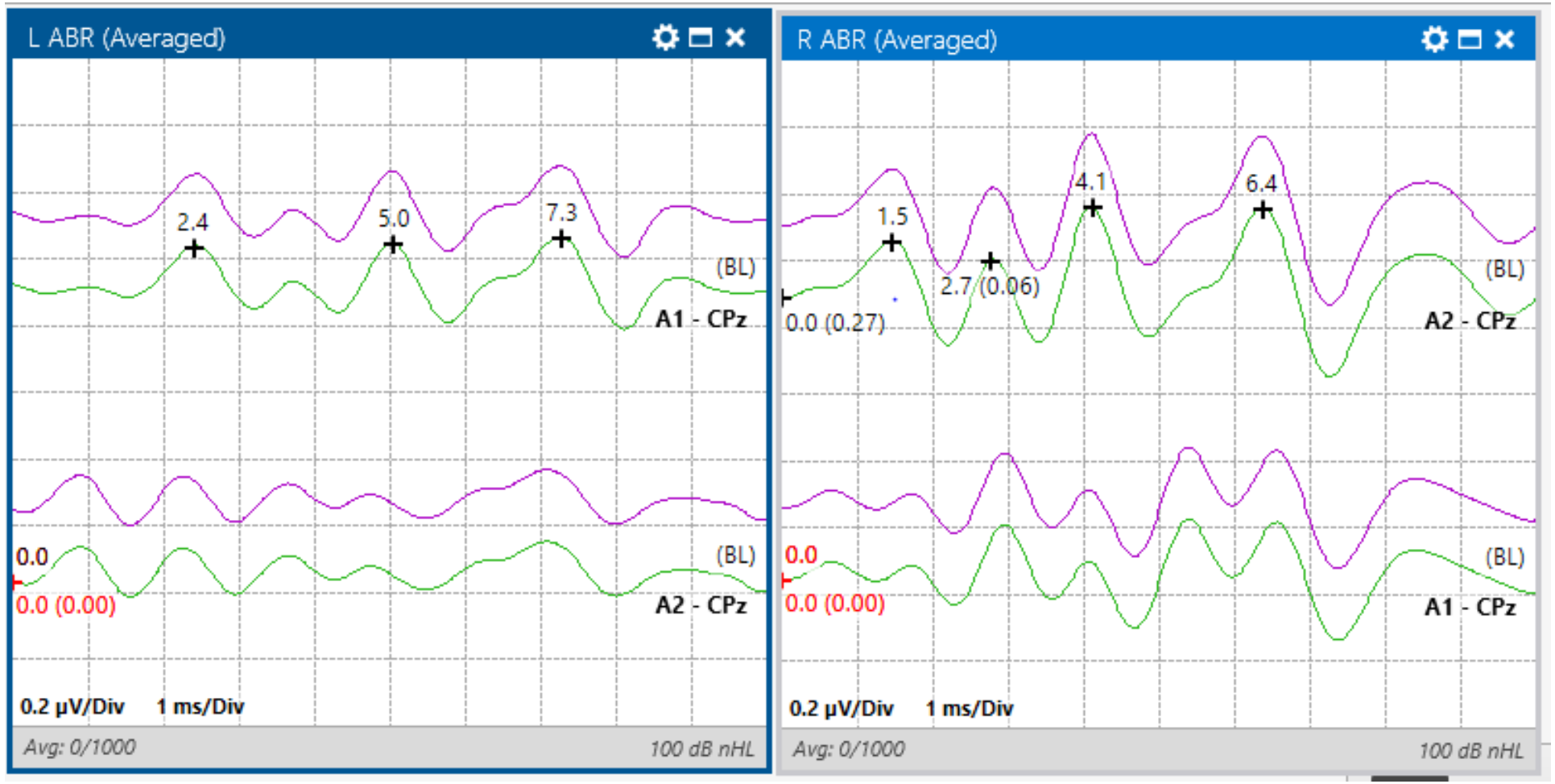
Baseline Transcranial Motor Evoked Potentials (TcMEPs)



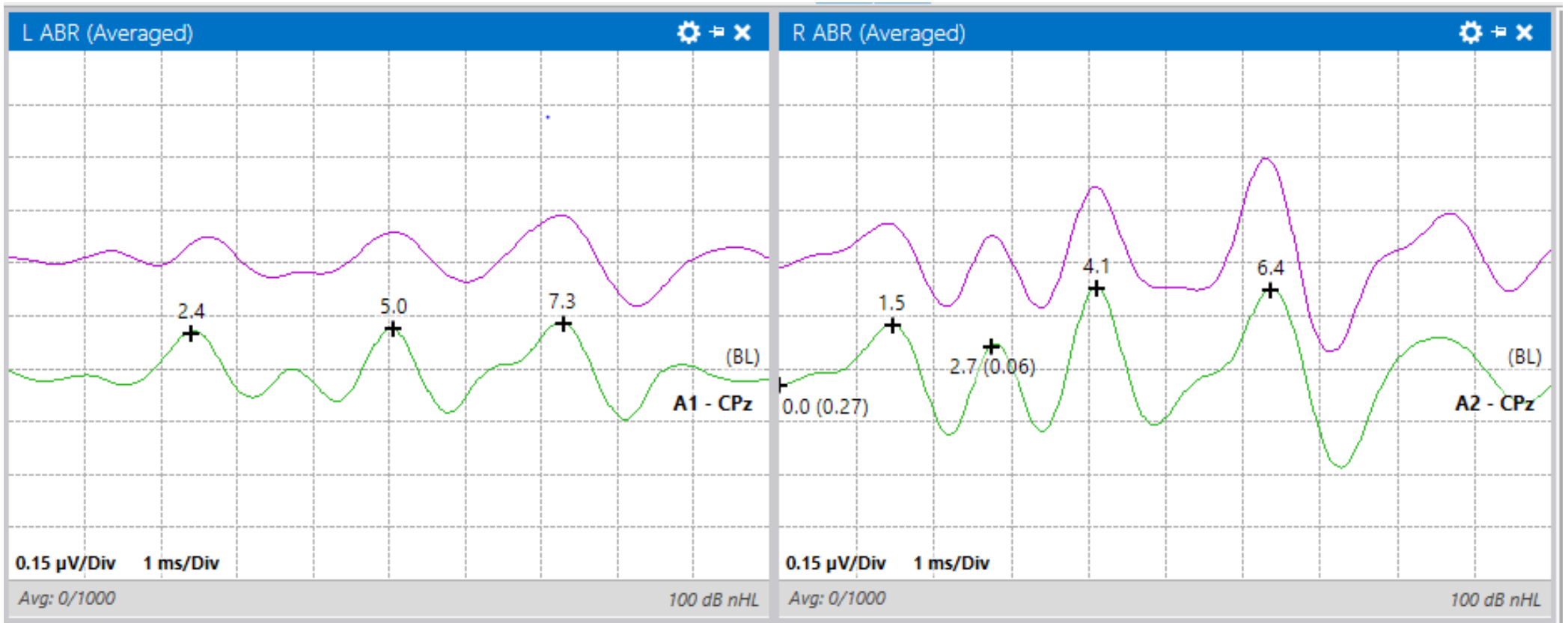
Baseline Somatosensory Evoked Potentials (SSEPs)



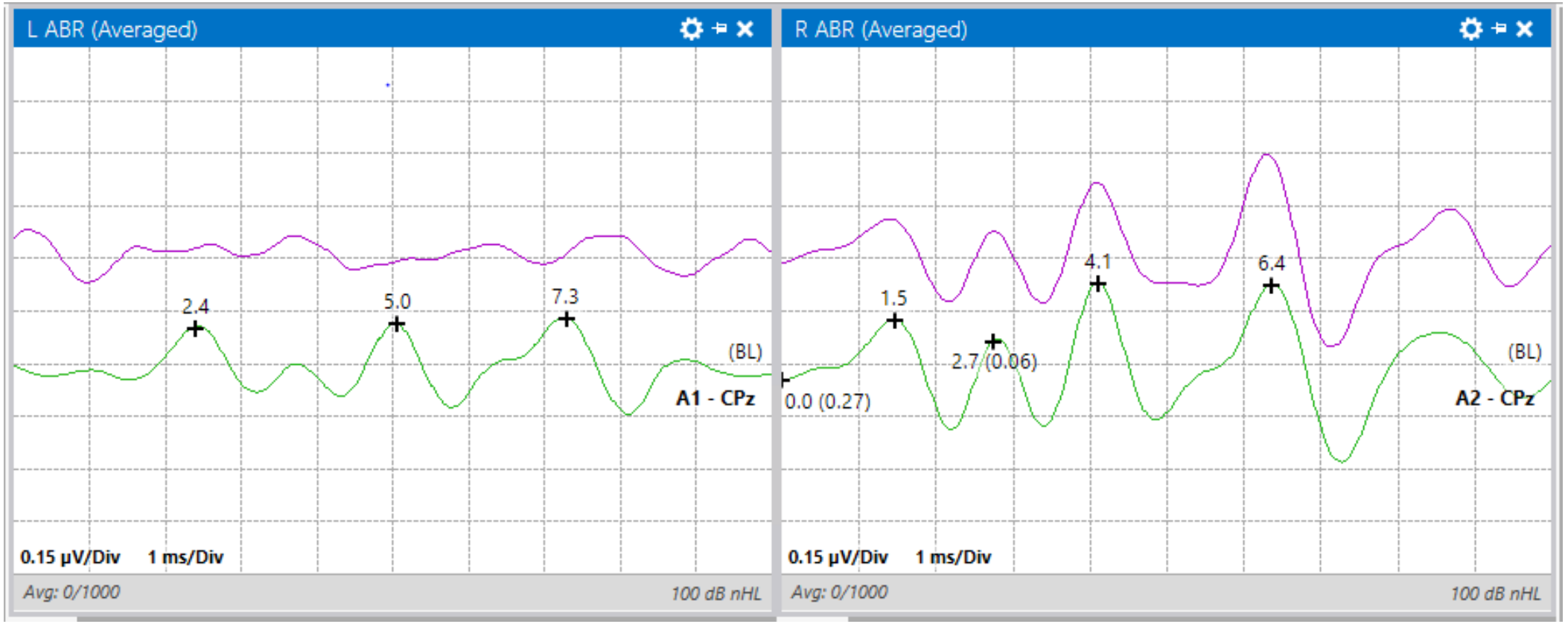
Baseline Auditory Brainstem Responses (ABRs)



ABR Trace #N


L ABR (Averaged)
2.4
5.0
7.3
(BL)
A1 - CPz
0.15 µV/Div
1 ms/Div
Avg: 0/1000
100 dB nHL
R ABR (Averaged)
1.5
2.7 (0.06)
4.1
6.4
0.0 (0.27)
(BL)
A2 - CPz
0.15 µV/Div
1 ms/Div
Avg: 0/1000
100 dB nHL

ABR Trace #N+1


L ABR (Averaged)
2.4
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Avg: 0/1000
100 dB nHL
R ABR (Averaged)
1.5
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4.1
6.4
0.0 (0.27)
(BL)
A2 - CPz
0.15 µV/Div
1 ms/Div
Avg: 0/1000
100 dB nHL

STOP

In this moment…

- What is the surgeon doing?
  - Can it be reversed?
- Does this change meet alarm criteria for this IONM modality?
- What structure(s) are at risk right now?
- What are anesthesia levels?
- What are the patient's vital signs?
  - What is the patient's blood pressure?
  - What is the patient's temperature?
  - What is the patient's hematocrit?

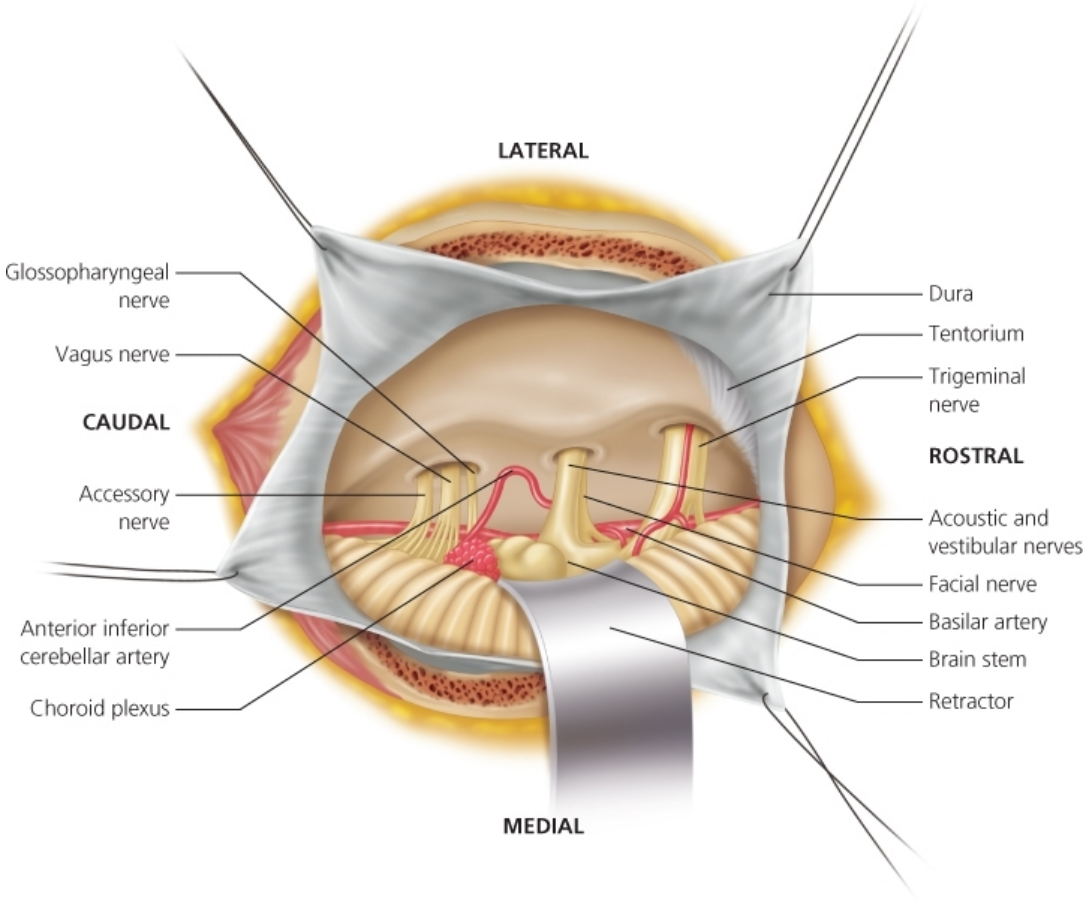
In this moment…

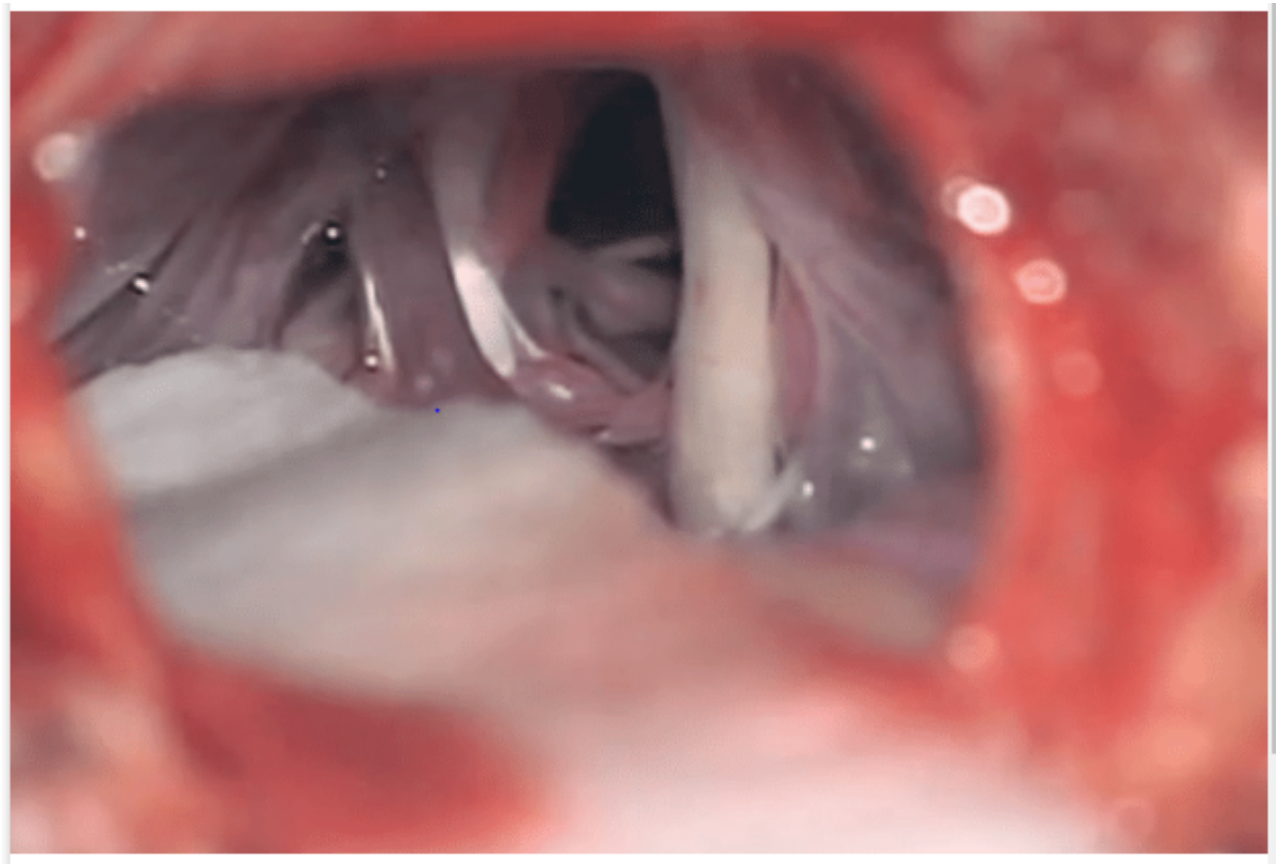
- Could it be technical?
- How much blood loss has there been?
- Do we need STAT imaging of some sort?
- Could it be positional?
- Etc., etc., etc.

Medical Terminology
Etc.
Human Physiology
Neurophys
Etc.
Pathophys
Alarm Criteria
Anatomy
Etc.
Etc.
Surgical Procedures
Neuroanatomy
Etc.
Etc.
Anesthesia
Etc.
Etc.
Etc.
Electrophys
Etc.

So, what happened?

CPA Surgical Anatomy



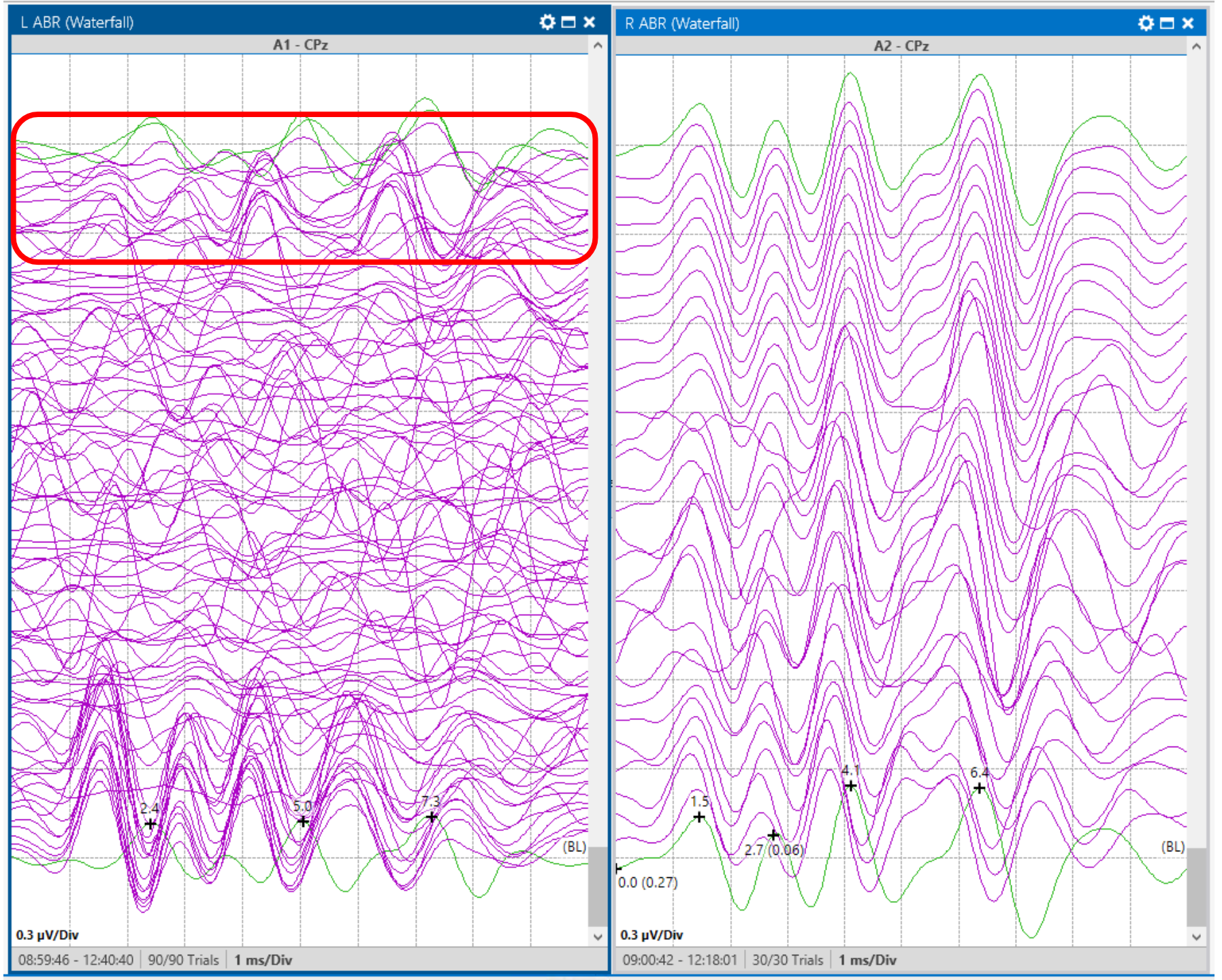


What did we recommend?

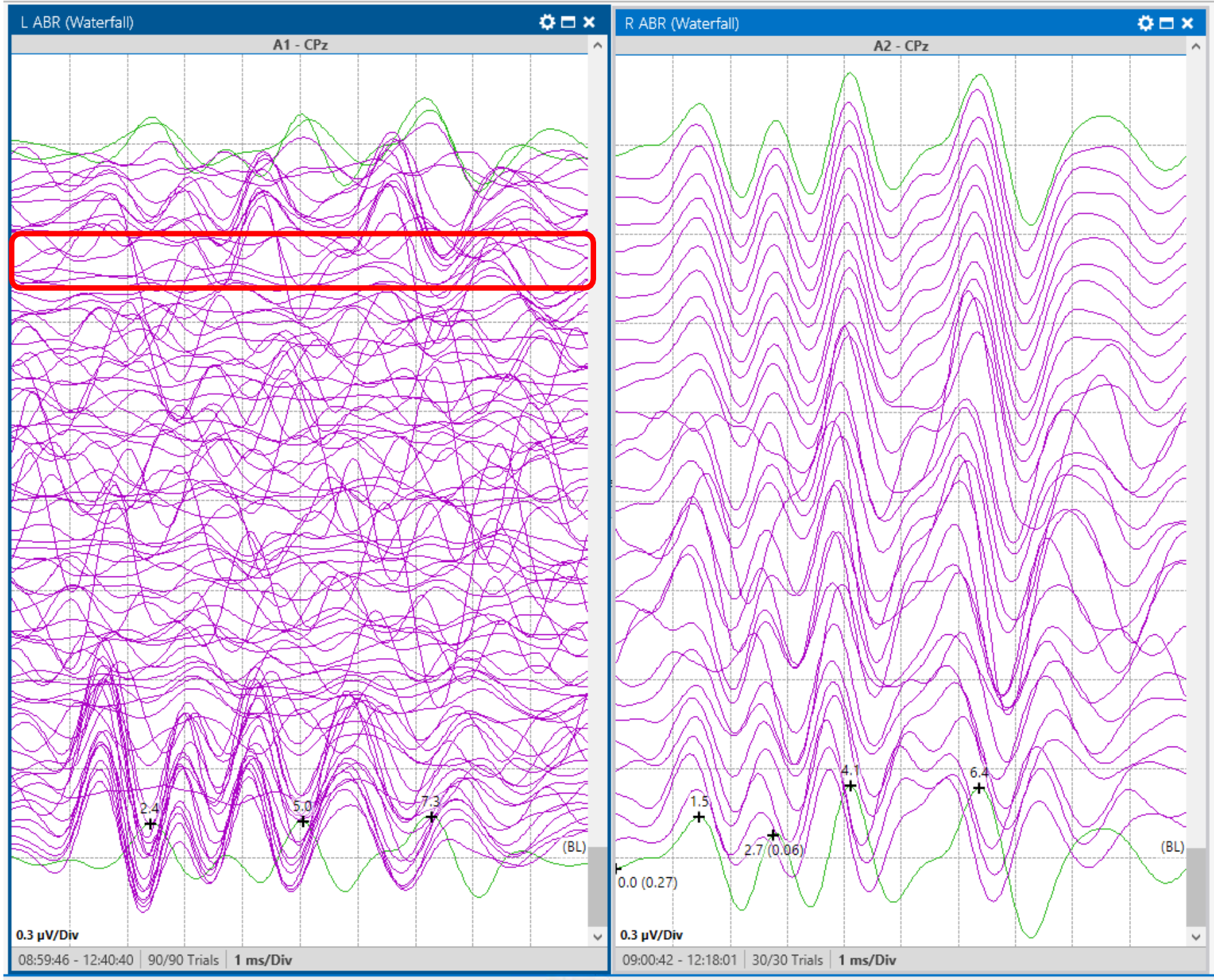
Interventions:

- Release retraction
- Surgical pause
- Warm irrigation
- Wait for response to return
- Lather, rinse, repeat as often as necessary

ABR Waterfalls



ABR Waterfalls



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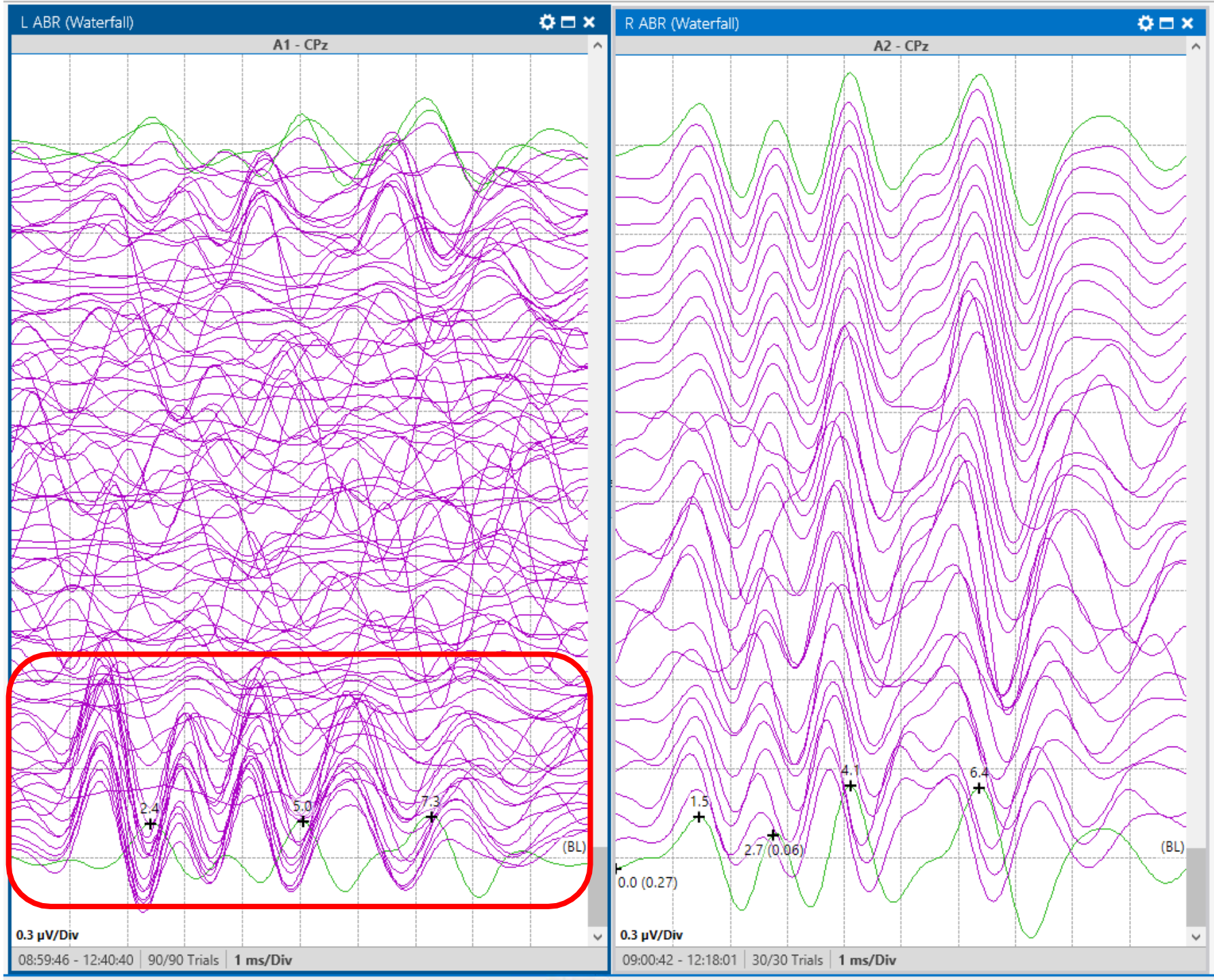
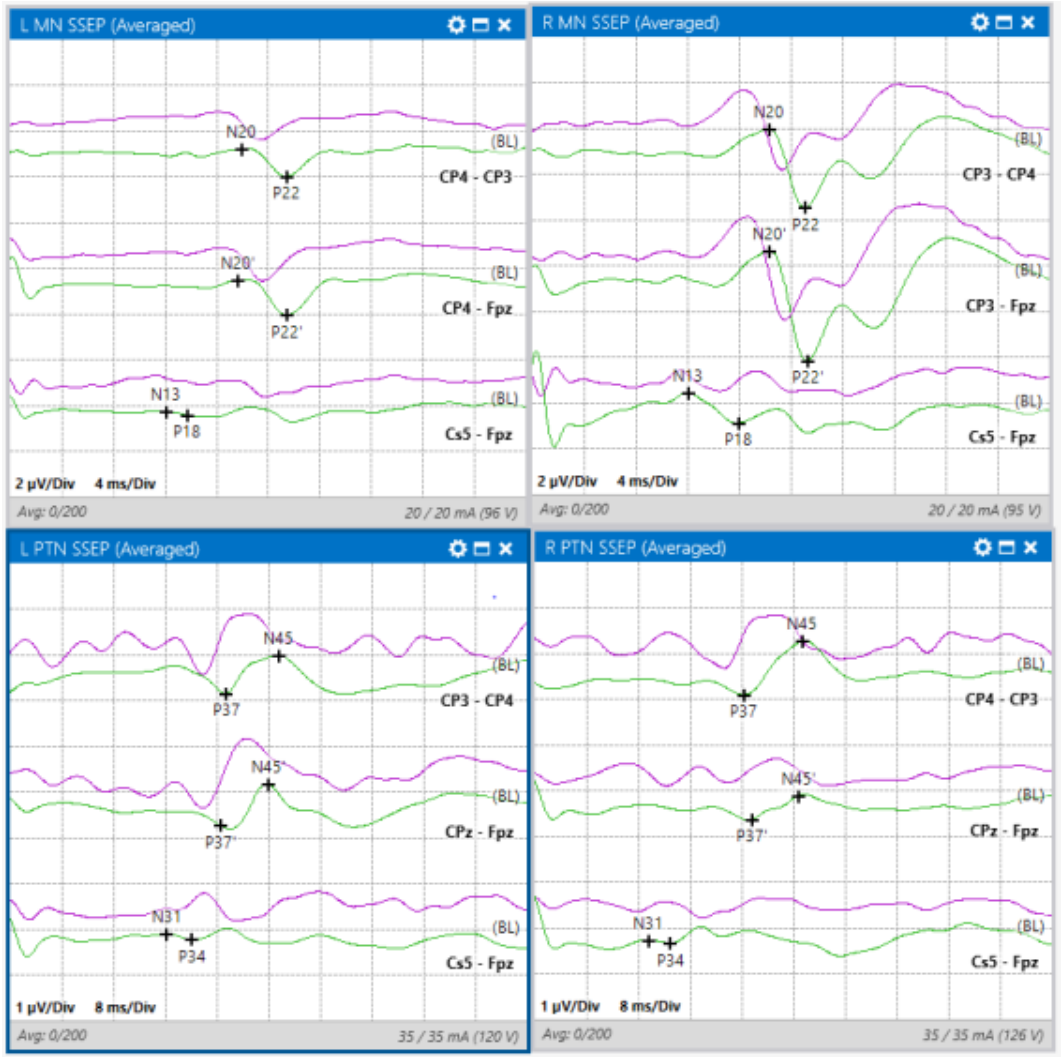
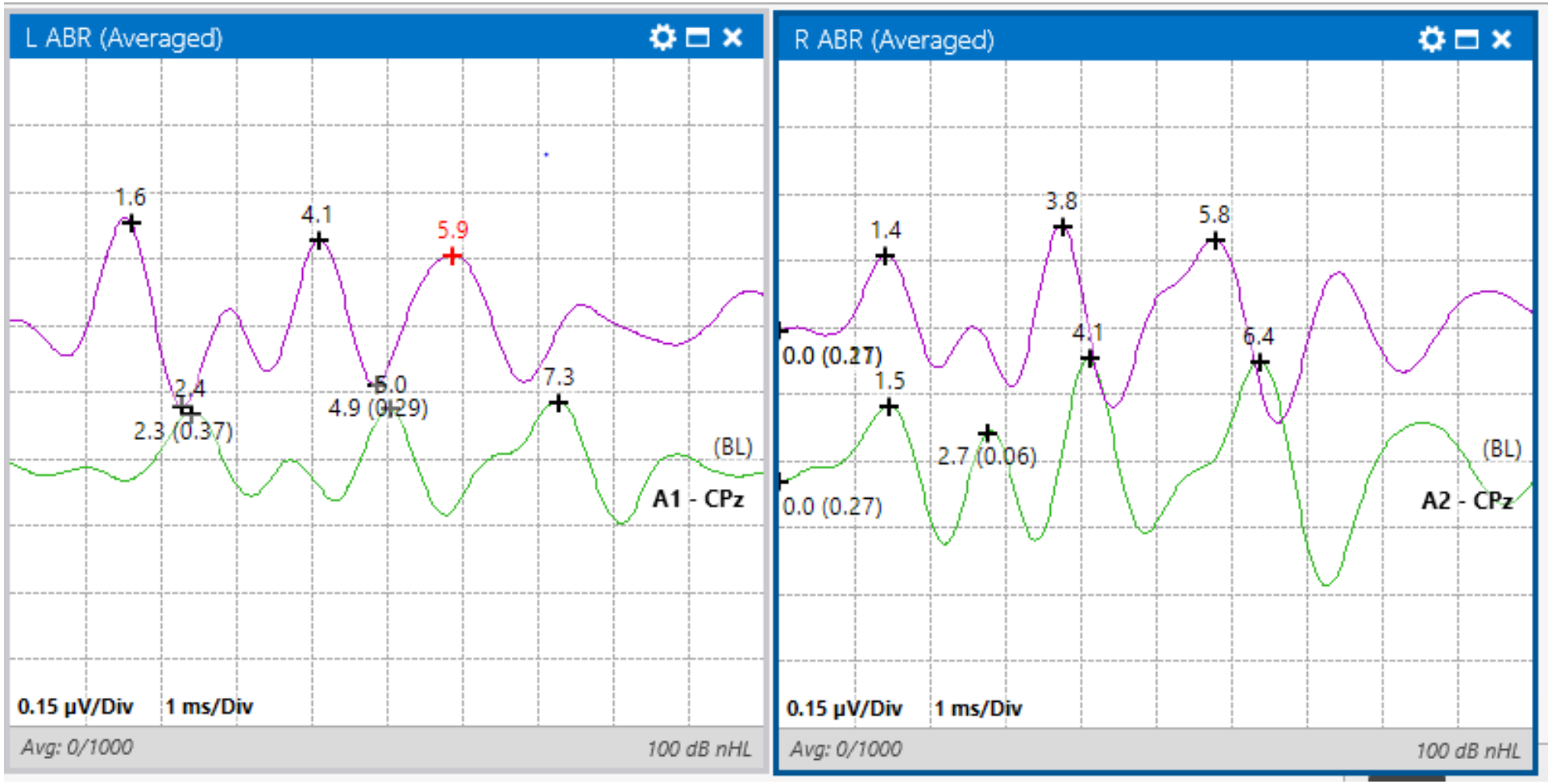


Closing Transcranial Motor Evoked Potentials (TcMEPs)

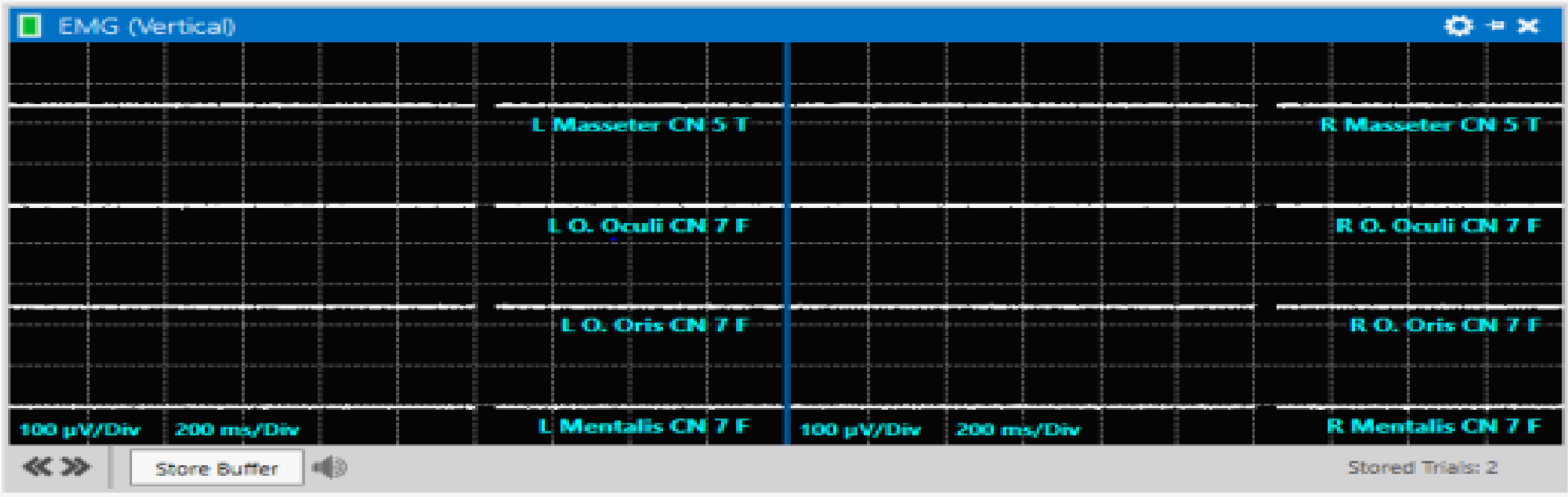
Closing Somatosensory Evoked Potentials (SSEPs)



Closing Auditory Brainstem Responses (ABRs)



Electromyography (EMG)



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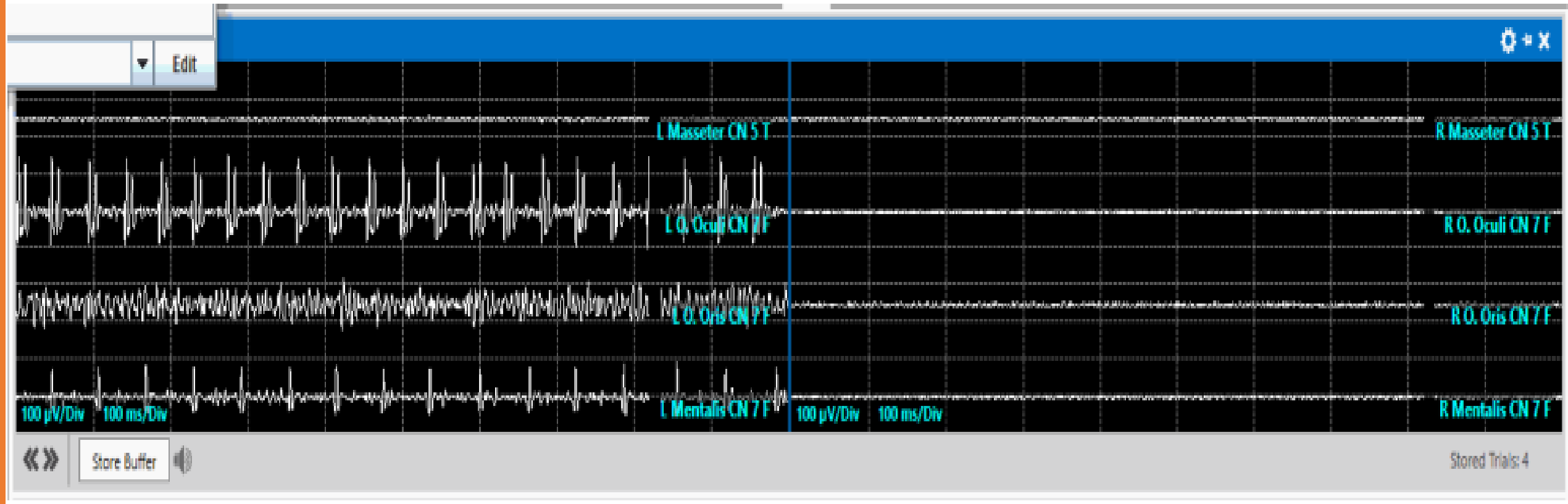

4. Why Audiology and IOM?

For Business Plans, Marketing Plans, Project Proposals, Lessons, etc

Why Audiology and IOM?

- Audiologists are experts in electrophysiology and evoked potentials
  - In many ways, an evoked potential is an evoked potential
- Audiologists are experts at site-of-lesion determinations
- Audiologists are experts in anatomy, neuroanatomy, neurophysiology, etc. etc. etc.

- SO many of the concepts are the same!
- It is a natural transition!

Credits

Special thanks to the other members of my team:

- Rich Vogel, PhD, DABNM
- Krystal Kenney, MPH, CNIM
- Lauren DeBryun, CNIM

Thanks!

Any questions?

You can find me at:

kiara.ebinger@rtnassociates.com