

Critical Care Neurosonology

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Disclosures

- Board member of the American Society of Neuroimaging, have received dues reimbursement as ASN representative to the AMA House of Delegates



Objectives

- Describe the use of TCD for serial monitoring of ICP
- Illustrate the use of TCD to monitor the treatment effect of CNS vasculitis
- Explain how TCD can be used to determine when it is safe to move a patient out of the ICU



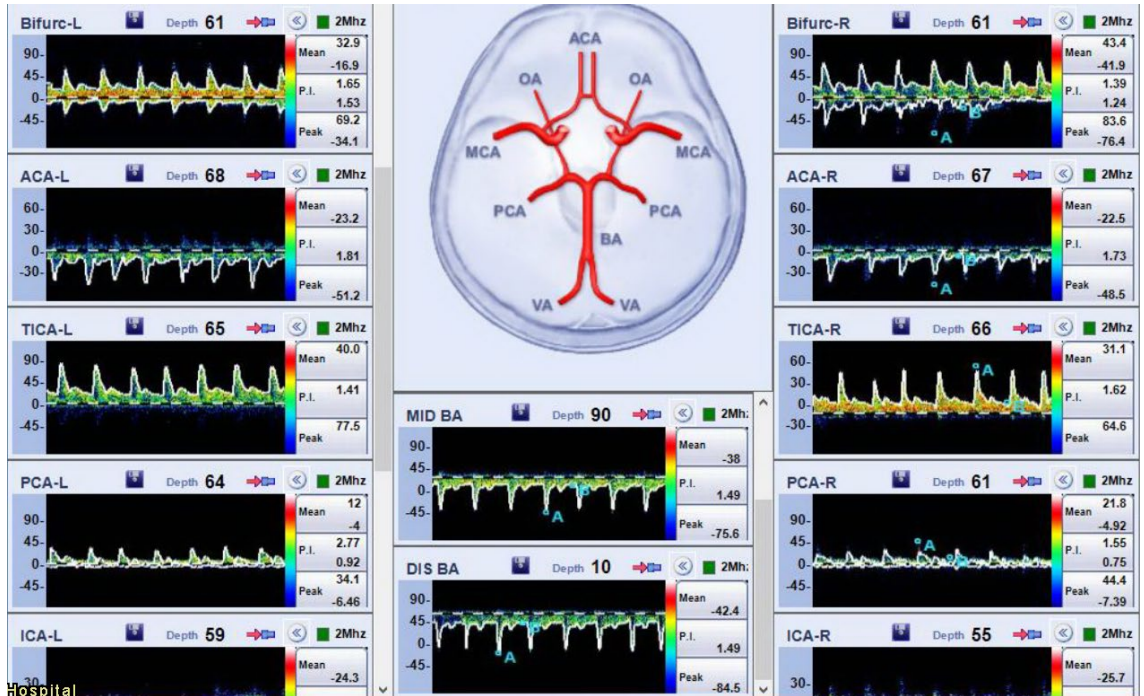
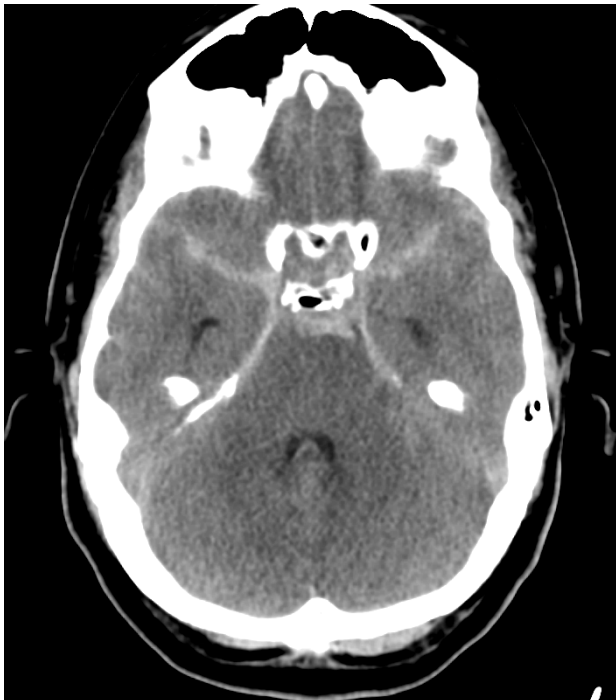
Non-invasive ICP monitoring

- In general increased PI usually is indicative of increased ICP and/or intracranial atherosclerosis
 - No inference can be made based on a single TCD
 - Serial TCD monitoring allows for monitoring of trend in PI
- Globally elevated PI values vs. focal PI elevation
 - Global: global intracranial hypertension or diffuse intracranial atherosclerosis
 - Focal: local intracranial hypertension (mass effect, brain compression, cerebral edema) or focal intracranial atherosclerosis

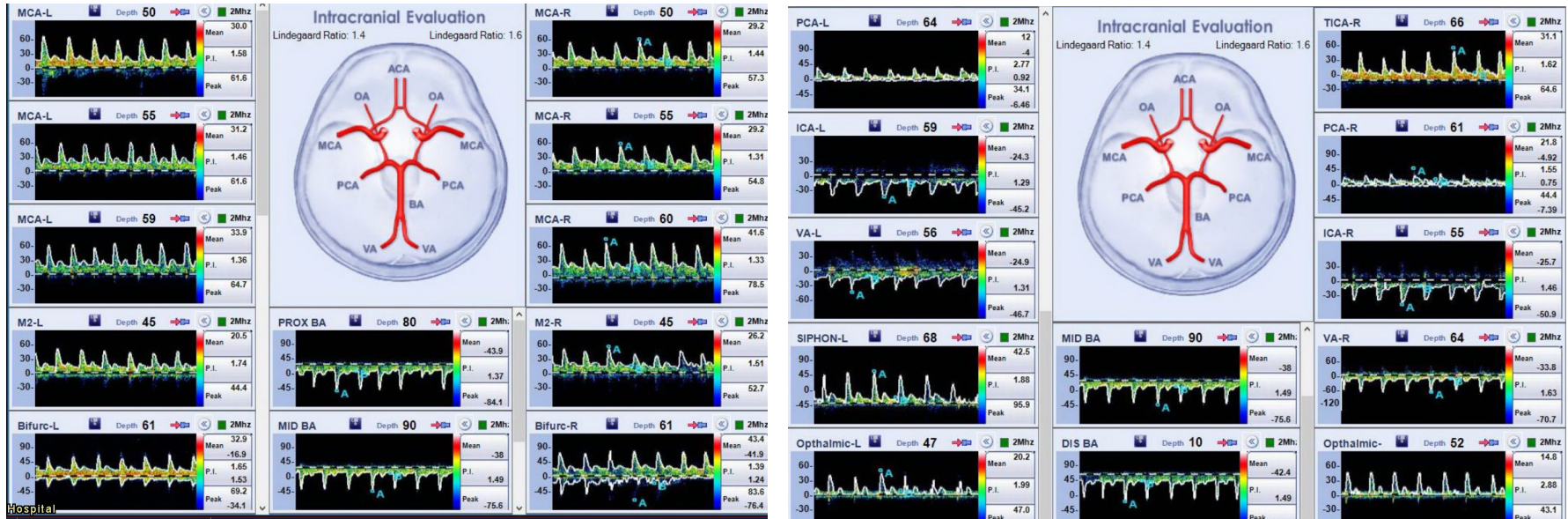


Serial monitoring of PI

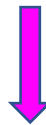
- Case 1: 40-year-old male without any medical comorbidities develops sudden onset of severe headache at work



Serial monitoring of PI

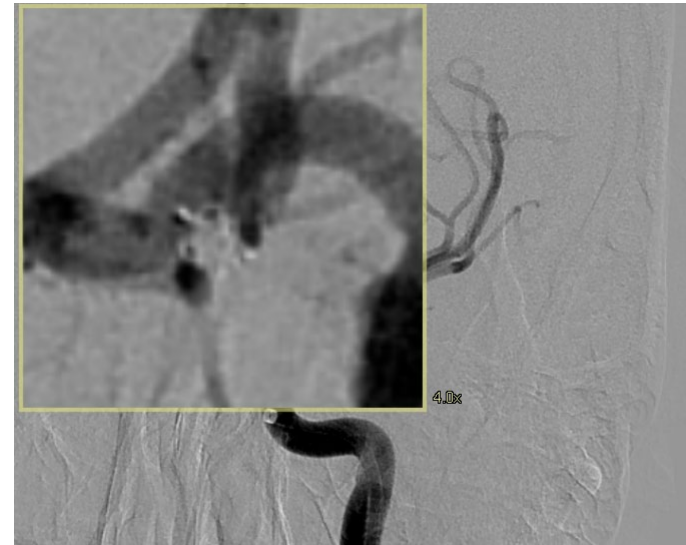


Patient with severe headache resistant to acetaminophen and opioids

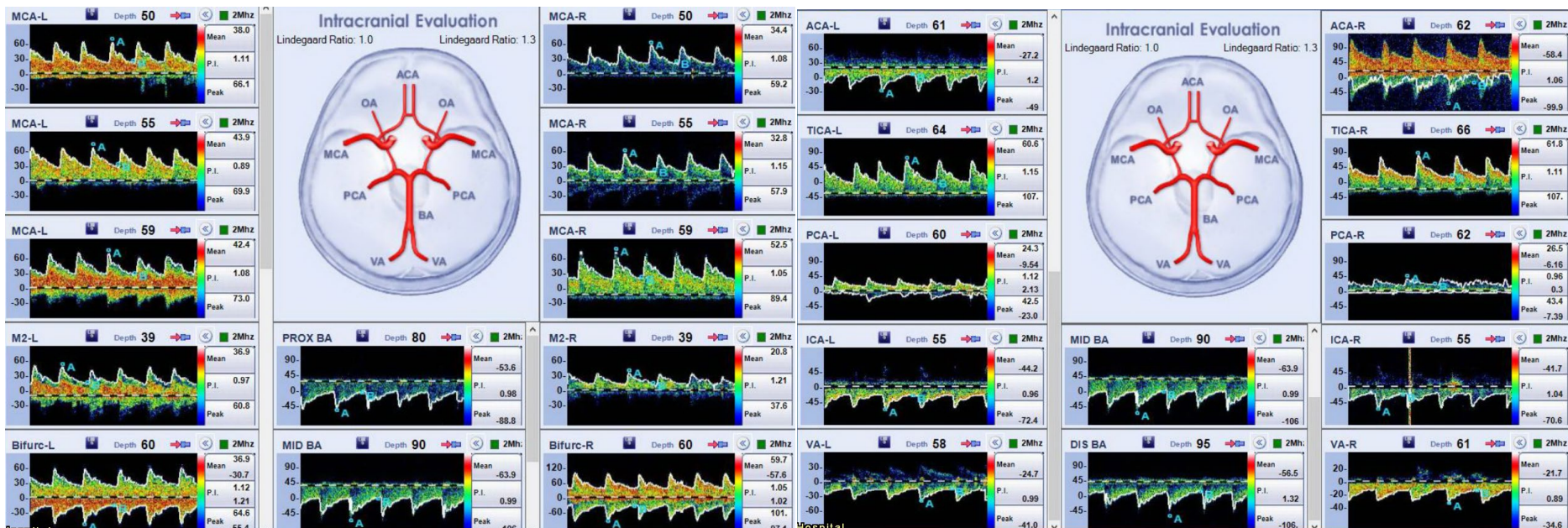


Patient given 100 G IV mannitol

Serial PI monitoring



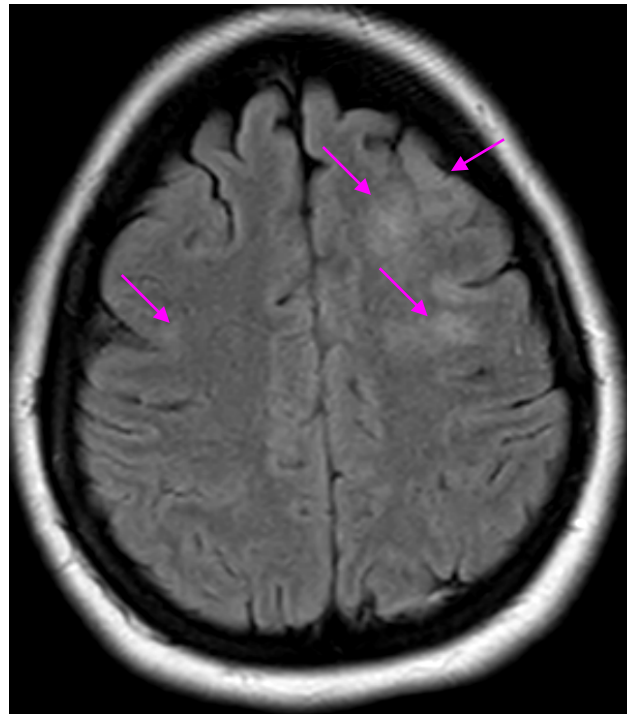
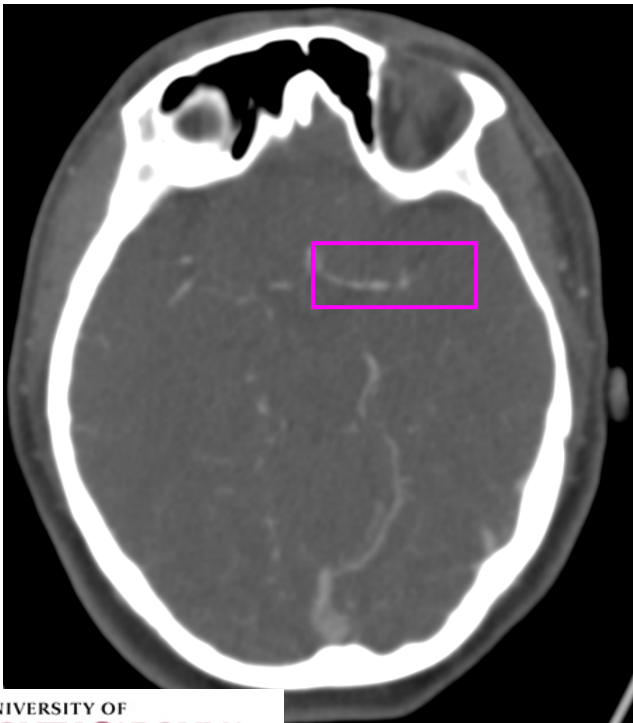
Serial PI monitoring



Starting Blood Pressure: 149/73 mmHg.
 Ending Blood Pressure: 126/63 mmHg.
 Temperature: 98.5

Monitoring of treatment effect

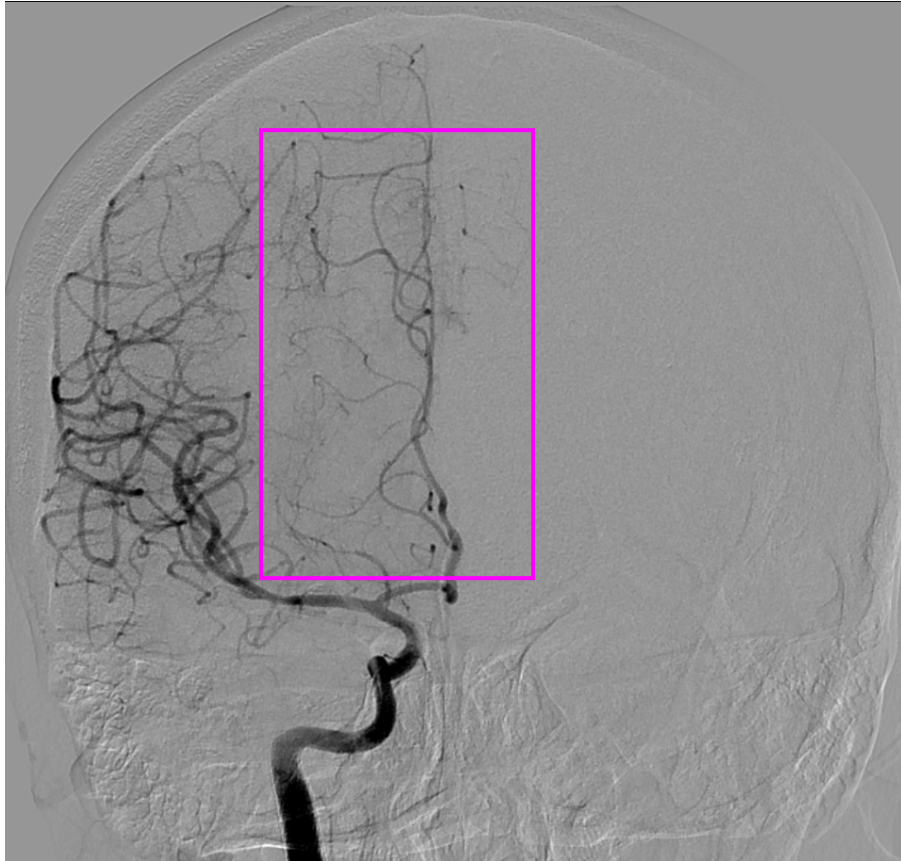
- **Case 2:** 24 yo F with traumatic cervical cord injury, quadriparesis, and carotid dissection with pseudoaneurysm two years ago. Now admitted due to persistent severe headache and abnormal CTA with concern for multifocal arterial stenosis.



FLAIR MRI
with
multifocal
hyperintensities



Monitoring of treatment effect



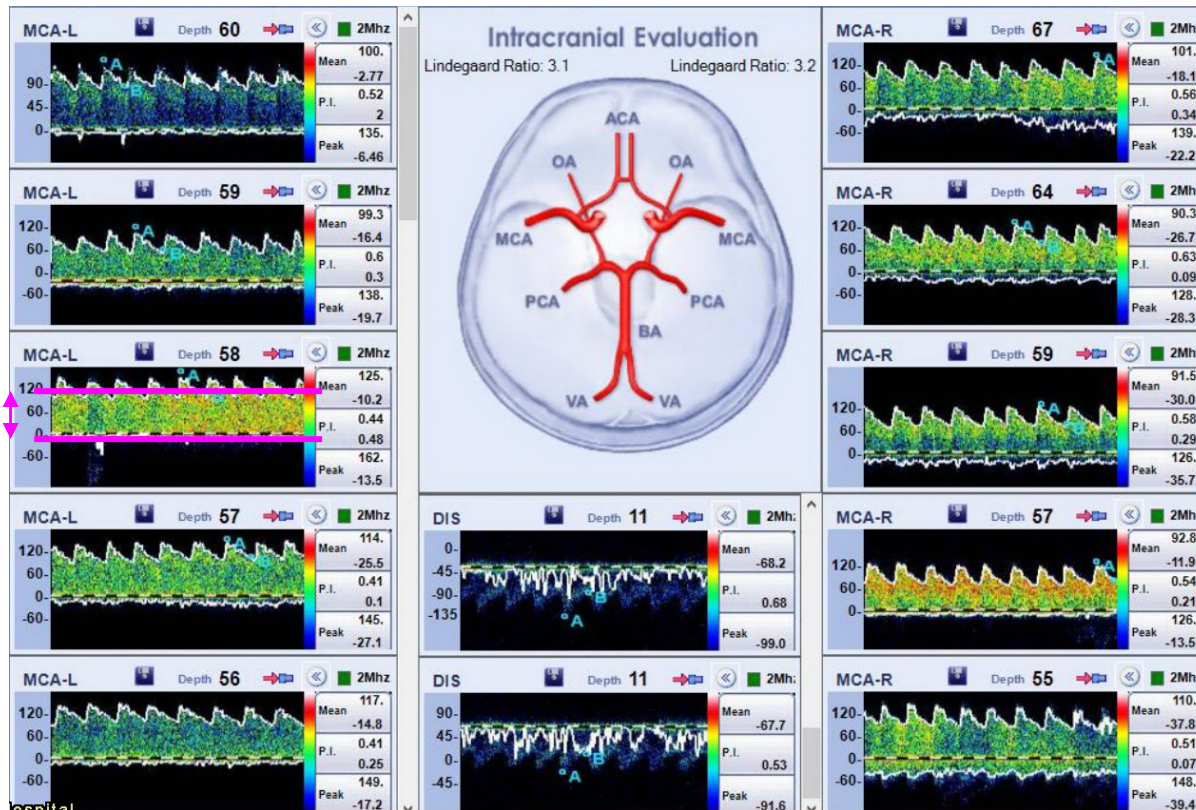
Right and left ICA injections on cerebral angiogram showing multifocal areas of stenosis



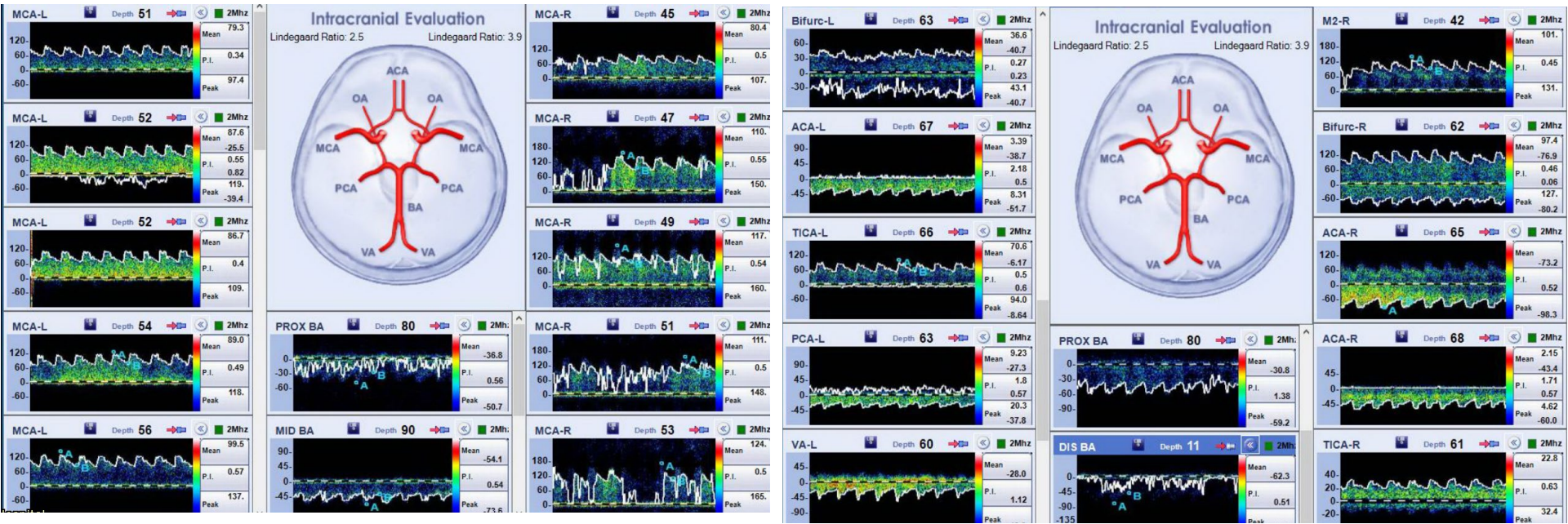
Monitoring of treatment effect

- Diagnosed with CNS vasculitis and started on 1 Gram IV methylprednisolone daily
- Transcranial Doppler ultrasound was ordered to monitor the patient's response to steroid therapy. Note marked hyperemia.

Day 1
 -PI values extremely low
 -EDV is greater than 50% of PSV supporting hyperemia



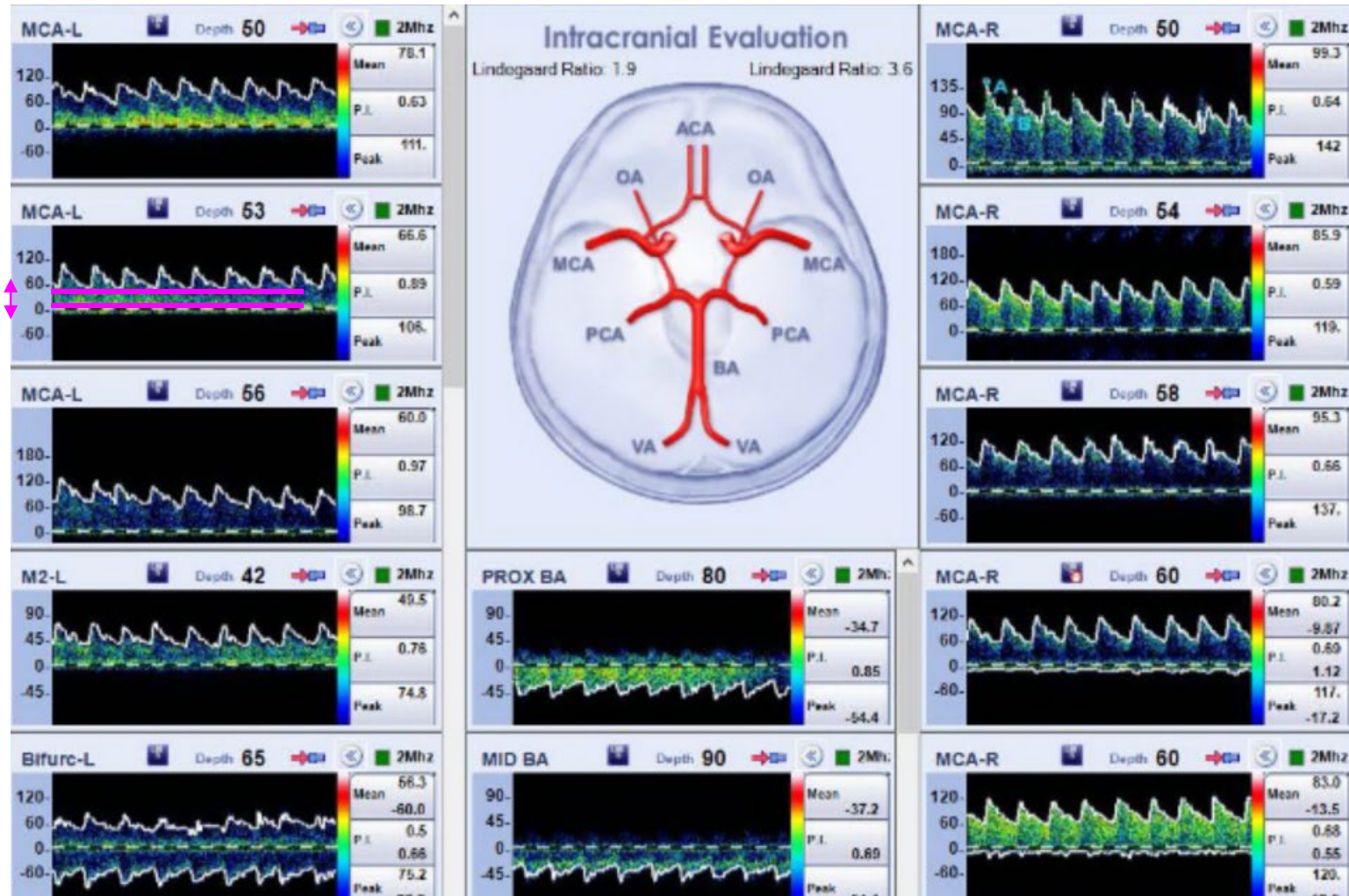
Monitoring of treatment effect



Monitoring of treatment effect

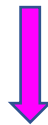
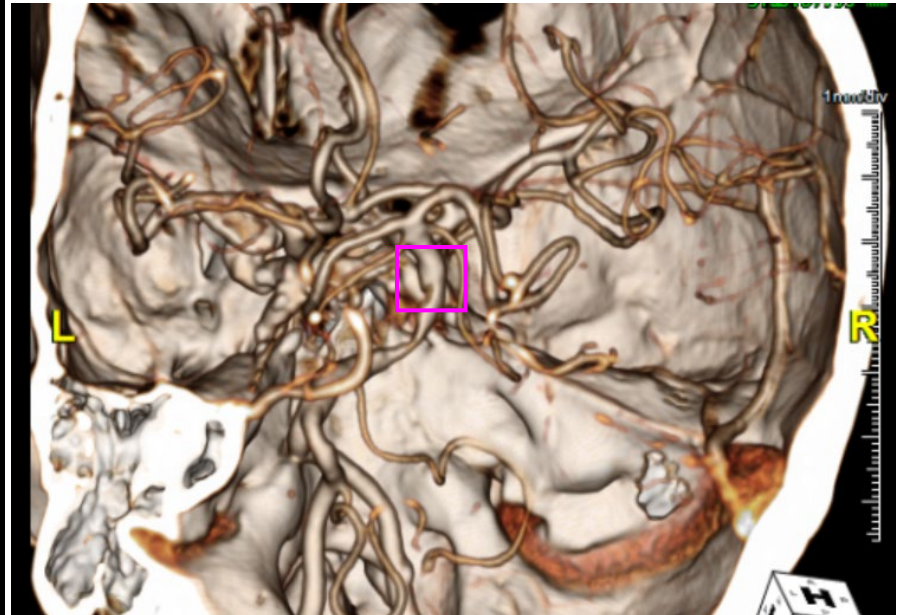
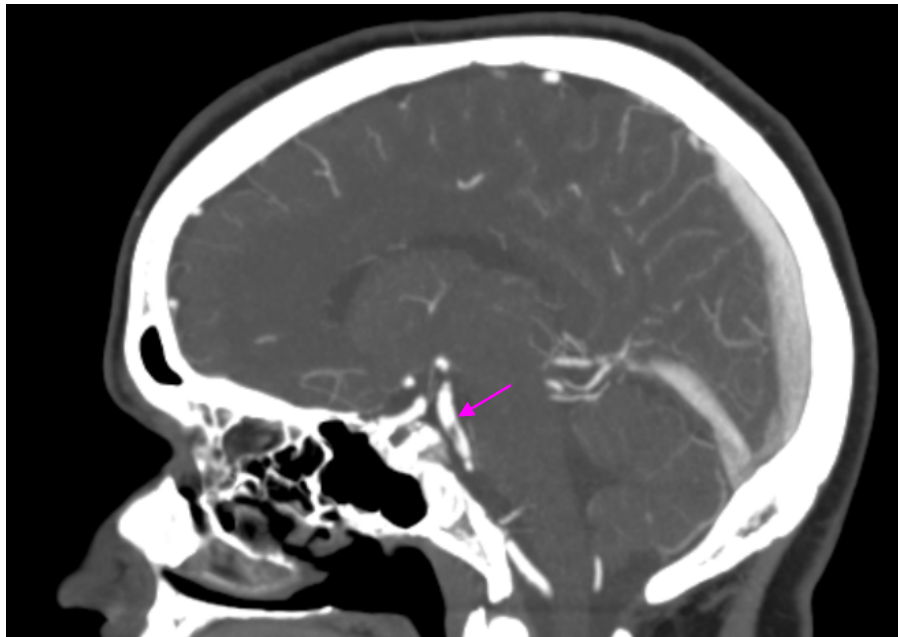
Day 3

-PI values nearly normalized
-EDV is less than 50% of PSV for the most part supporting resolution of hyperemia



Determining patient disposition

- 61-year-old female with nausea, dizziness, headache 12 hours prior to presentation to the hospital, now noted to have non-occlusive basilar artery thrombosis (NIHSS 3)



Patient started on a heparin infusion

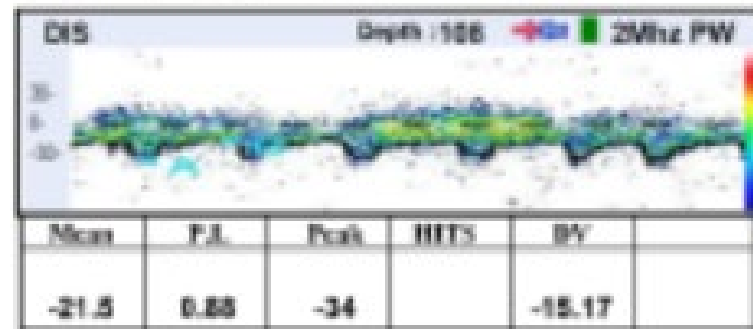
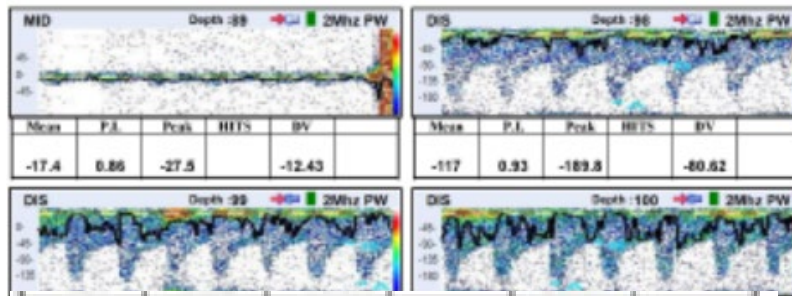
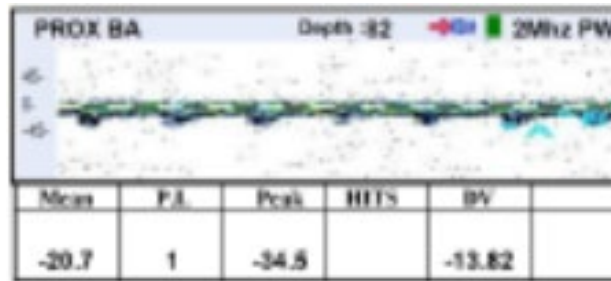


Determining patient disposition

Serial TCD monitoring to assess the state of the basilar artery

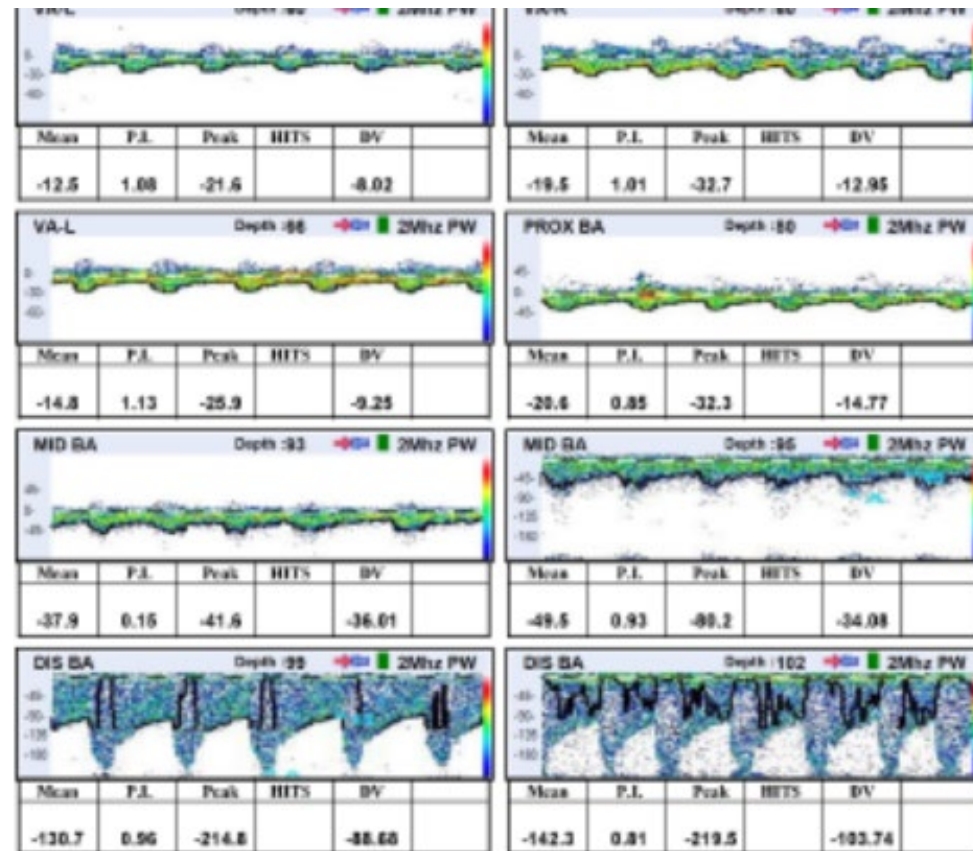
Day 1

-Focal stenosis in mid-basilar



Day 3

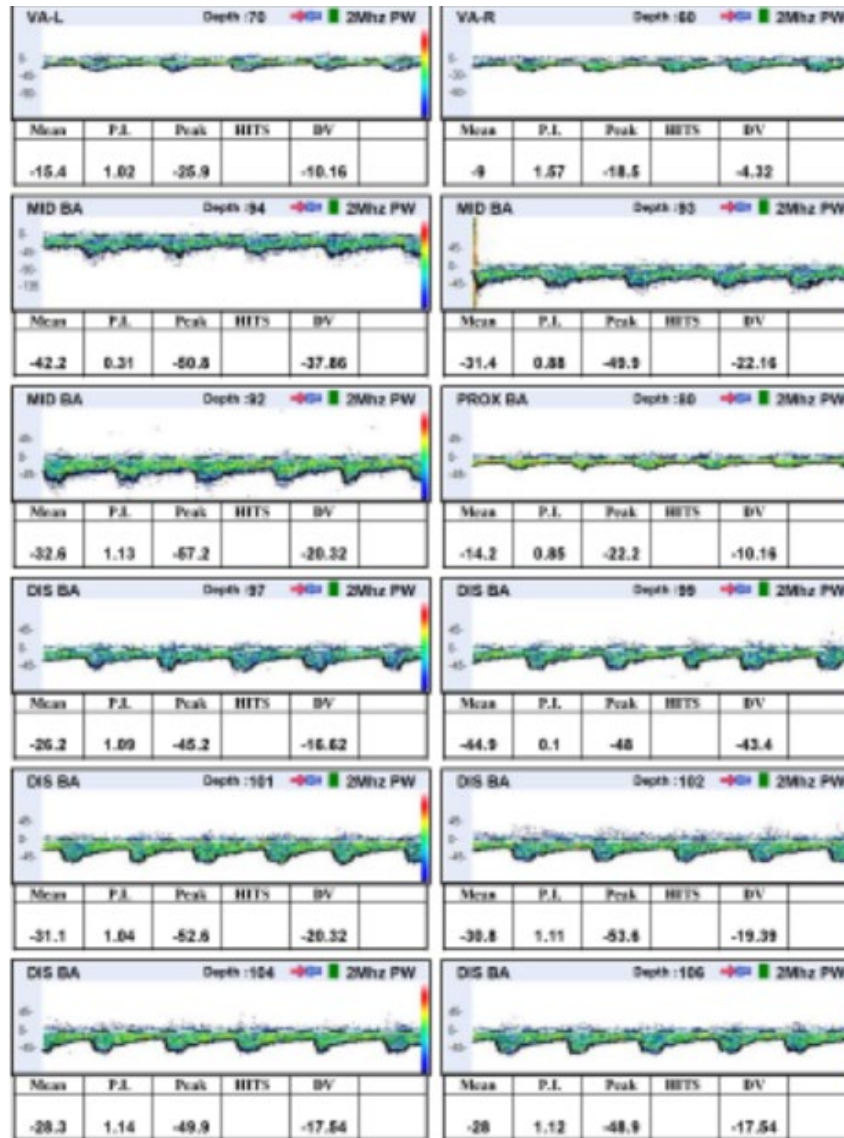
-Essentially unchanged



Determining patient disposition

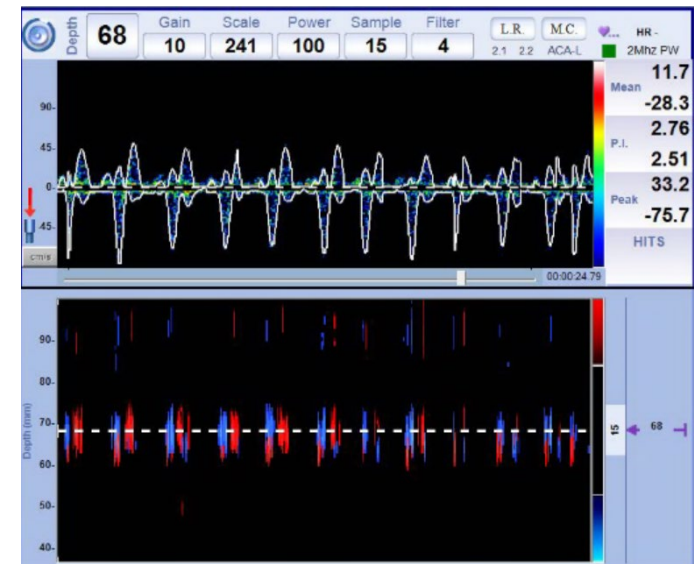
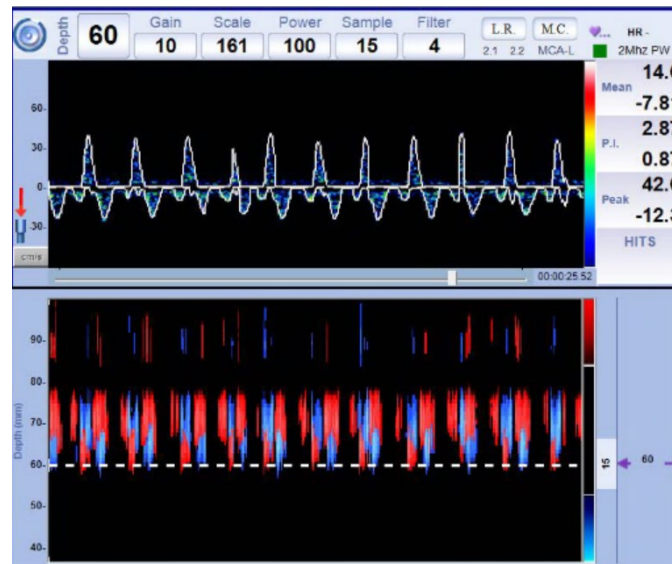
Day 5

Basilar artery is patent and the patient is transitioned to dual antiplatelet therapy and moved out of the Neuro ICU

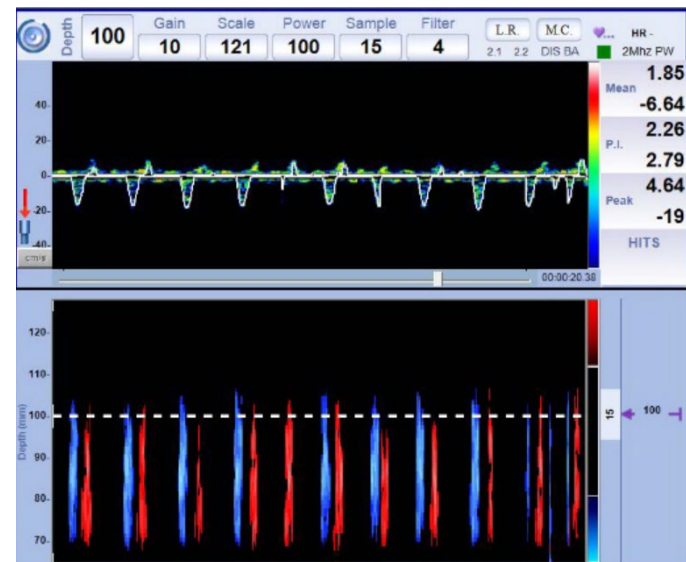
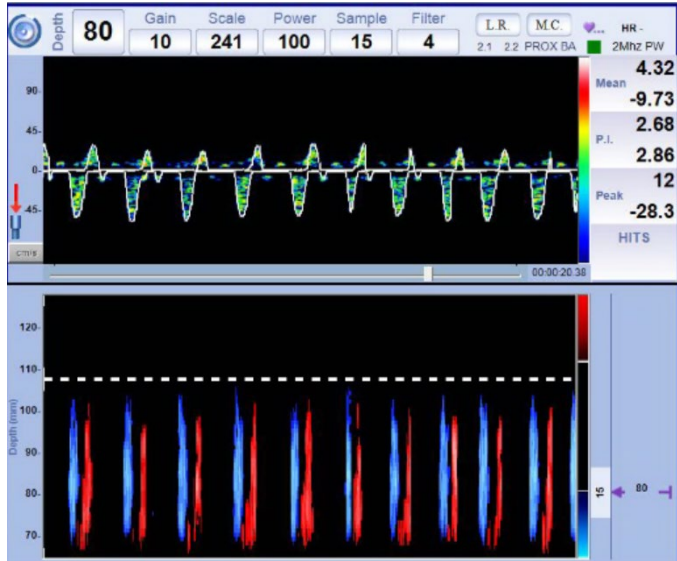
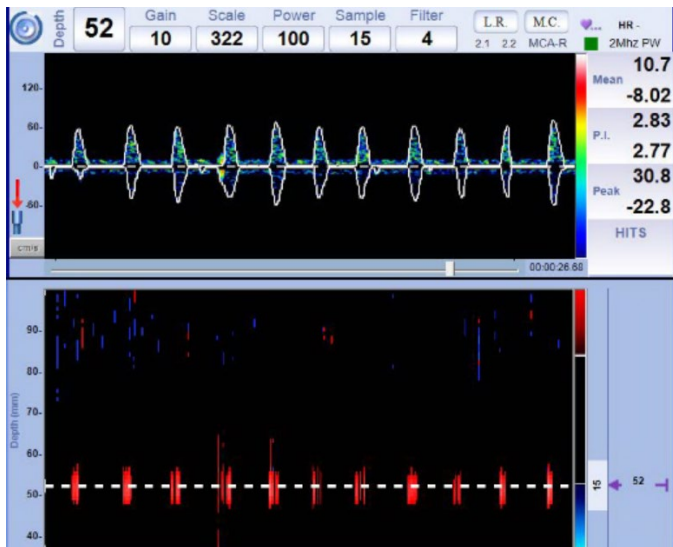


Brain death monitoring

66-year-old homeless male with known ACOM aneurysm presents after being discovered unconscious.



Brain death monitoring



Brain death monitoring

First clinical exam revealed the patient to have intact cough despite TCD findings.

Second clinical exam was performed 4 hours later demonstrating loss of cough reflex and the patient was declared deceased

The TCD findings prompted the team to re-examine the patient in a short interval as opposed to waiting until the following day as would be typical thereby leading to earlier declaration of brain death and maximizing the potential for organ procurement



Questions

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