



The American Society of Neuroimaging 2016 Annual Meeting Abstracts

1. TB Vasculitis and Strokes in a Immucopotent: Rare Diagnosis becomes more Rarer if not Thought.

Zain Guduru^{1,2,3}, Abhishek Purohit^{1,2,3}, Sandeep Rana^{1,2,3}

¹Allegheny General Hospital Pittsburgh, PA, USA, ²Drexel School of Medicine Philadelphia, PA, USA, ³Temple School of Medicine Philadelphia, PA, USA

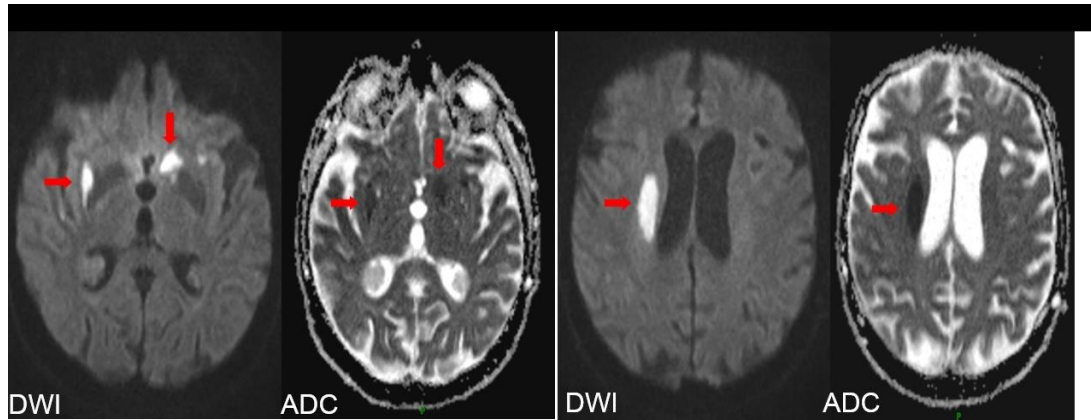
BACKGROUND & PURPOSE: TB Meningitis with infarcts is fatal upto 3 times more often than in those without infarcts. Location of strokes includes Deep Sylvain region (presence of TB meningitis exudates at the level of basal cisterna). It is assumed that infarcts are due to vasculitis/ subsequent intimal proliferation +/- superadded thrombosis. Treatment includes combination of anti-TB drugs and dexamethasone.

METHODS: 76 year Caucasian male with history of hypertension presented with 2 months history of altered mental status. No TB risk factors. Ammonia (17) blood cultures, HIV, Hepatitis B, C and rheumatological panel were negative. CSF showed: opening pressure (20), WBC(230), RBC(233), Lymphs (58%), Neu(37%), Glu(30), Pro(195), IgG(24.5), ACE(4.7). VDRL, gram stain, strep B, H.influenza, S.pneumo: negative. All viral studies: negative. ADA: 1. Culture: negative. CSF cytology: mature lymphocytes, monocytes and few neutrophils. No malignant cells. Immunophenotype: findings were NOT diagnostic of lymphoproliferation. TB PCR was positive. Quantiferon gold test for TB was indeterminate. Dexamethasone and anti-TB drugs were started which showed improvement gradually.

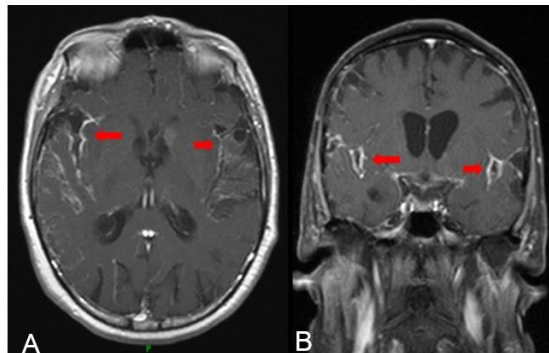
RESULTS: MRI brain showed multifocal infarctions and leptomenigeal enhancement. CT angiography head showed diffuse narrowing and irregularity involving the circle of Willis and the proximal vasculature. Meningeal biopsy AFB stain shows AFB positive structure in area of lymphohistocytic infiltrate.

CONCLUSIONS: Even though diagnosis of CNS TB is rare in a person with no risk factors, it is very much important to be considered in the differential diagnosis

as failure of starting appropriate treatment causes higher mortality. TB vasculitis should be considered if any neurological deterioration arising during the course of TB.



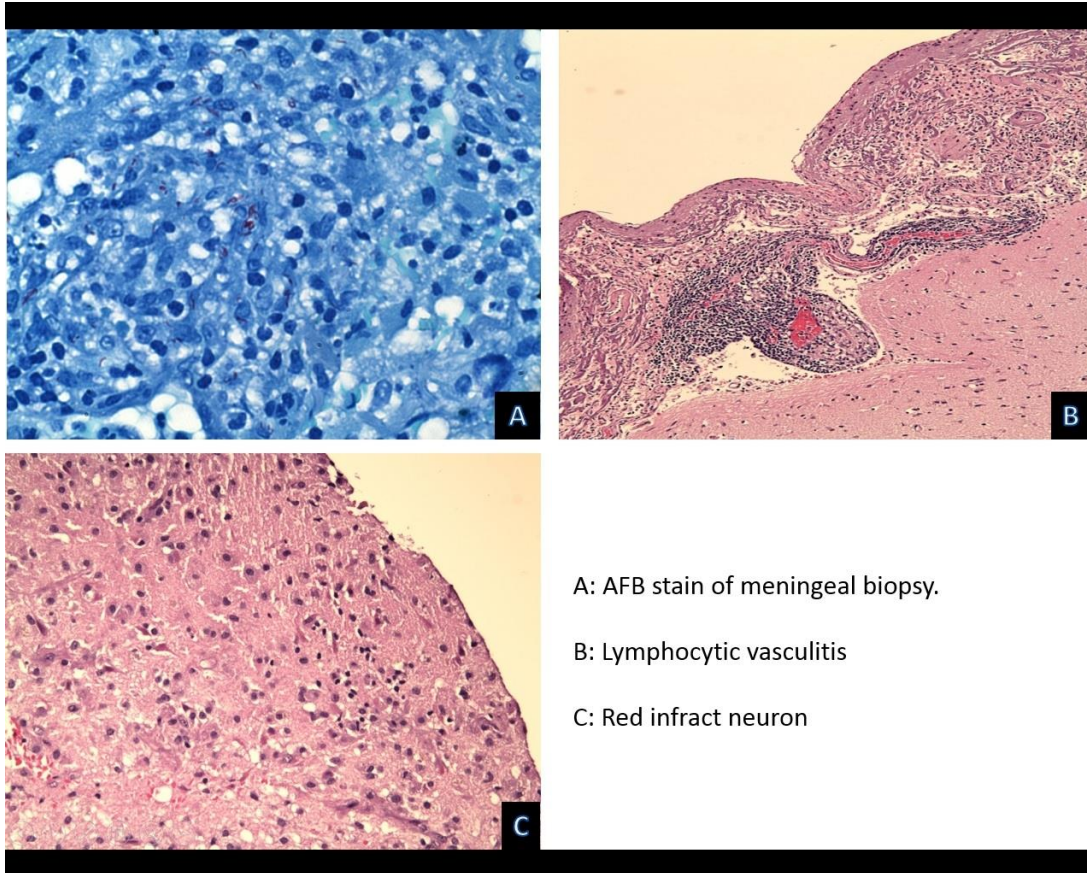
Multifocal infarctions



Leptomeningeal Enhancement



Cerebral Vasculitis



2. Impact of phenomena " Distal Embolization " in current acute ischemic stroke (AIS) treatment for emergent large vessel occlusion (ELVO).

Vishal Jani¹, Mohammad-Rauf Afzal², Muhammad Shah Miran², Ahmed Riaz ², Jillian Schurr¹, Anmar Razzak¹, Syed Hussain¹, Adnan I Qureshi²

¹Michigan State University/ Department of Vascular and Endovascular Neurology East Lansing, MI, USA, ² University of Minnesota/Department of Neurology and Neurosurgery Minneapolis, MN, USA

BACKGROUND & PURPOSE: Periprocedural acute distal embolization is a known complication of acute ischemic stroke (AIS) treatment for emergent large vessel occlusion (ELVO). To date there is limited data regarding its impact on complications and clinical outcomes.

METHODS: A cohort of retrospectively maintained prospective ELVO embolectomy registry patients (n=92) between the years of 2012 and 2014 was

reviewed for post treatment ADE, which was defined as appearance of an occlusion on a downstream vessel. The cohort was dichotomized into two groups (with and without distal embolization). Post-treatment 24-hour CT brain scan, 30 day mortality, intracerebral hemorrhage (ICH), and 30-day modified Rankin scale were collected and frequency analysis was performed to assess the complications and compare clinical outcomes.

RESULTS: The 92-patient cohort was dichotomized in ELVO with distal embolization (n=28) and ELVO without distal embolization (n=64). Overall rate of complications in patients with distal embolization versus patients without distal embolization was similar, e.g. symptomatic ICH (2 of 28 (7.1)% vs 9 of 64 (14.0)%, $p = 0.5$), 30-day mortality (2 of 28(7.1)% vs 10 of 64 (15.6)%, $p=0.4$), composite endpoint of in-hospital mortality, and ICH(symptomatic and Asymptomatic) 8 of 28 (28.5)% vs 20 of 64 (31.5)%, $p = 0.9$)

CONCLUSIONS: Our initial experience demonstrates that phenomena of distal embolization during AIS treatment does not have any major clinical impact in terms of complications and long-term clinical outcomes. Further studies are needed to assess the impact of distal embolization phenomena to understand clinical sequelae and to design the next generation of instrumentation.

3. Let's Tango: Approach to the Tandem Lesion

NIKIL SWAMY, SONAL MEHTA

PALMETTO HEALTH RICHLAND COLUMBIA, SC, USA

BACKGROUND & PURPOSE: Symptomatic acute basilar artery thrombosis with associated bilateral vertebral occlusion is a unique entity, occurring in ~3% of posterior circulation ischemic events common etiologies being atherosclerosis, giant cell arteritis, trauma and spontaneous dissection. These challenging interventional cases are associated with a poor prognosis and high rate of recurrent ischemia.

METHODS: Case Report and review of the literature.

RESULTS: A 63 year-old-male with hemiparesis and hemianopsia was excluded from IV thrombolysis due to MRI showing bilateral PCA territory infarcts with petechial hemorrhage. NIHSS improved from 8 to 4 after intervention.

Diagnostic angiogram revealed patent anterior circulation, basilar tip clot with

minimal left P1 and absent right P1 filling, and occluded left vertebral origin with collateral flow through ascending cervical branches. A glide wire navigated through the expected left vertebral artery ostium, was exchanged out for a coaxial system consisting of a Neuron 088 Max and an 058 Navien catheter. A Marksman microcatheter was navigated into the right PCA through the Navien placed at the distal vertebral artery. A solitaire thrombectomy was performed with Penumbra aspiration. Recanalization of the basilar artery but with distal occlusion of the right PCA as well as occlusion of the left PCA was achieved. Similarly, a thrombectomy of the left PCA achieve an overall TICl 2B recanalization.

CONCLUSIONS: The presence of tandem lesions in an acute stroke setting present a challenge for endovascular treatment. In relation to angioplasty with or without stenting of the proximal lesion, our report describes the potential for stand-alone acute thrombectomy.

5. Cause of Paradoxical Emboli: Presence of Levo-Atrial Cardinal Vein

John Hanna, Deepa Bhupali, Daniel Antonello

Montefiore Medical Center/Neurology Bronx, NY, USA

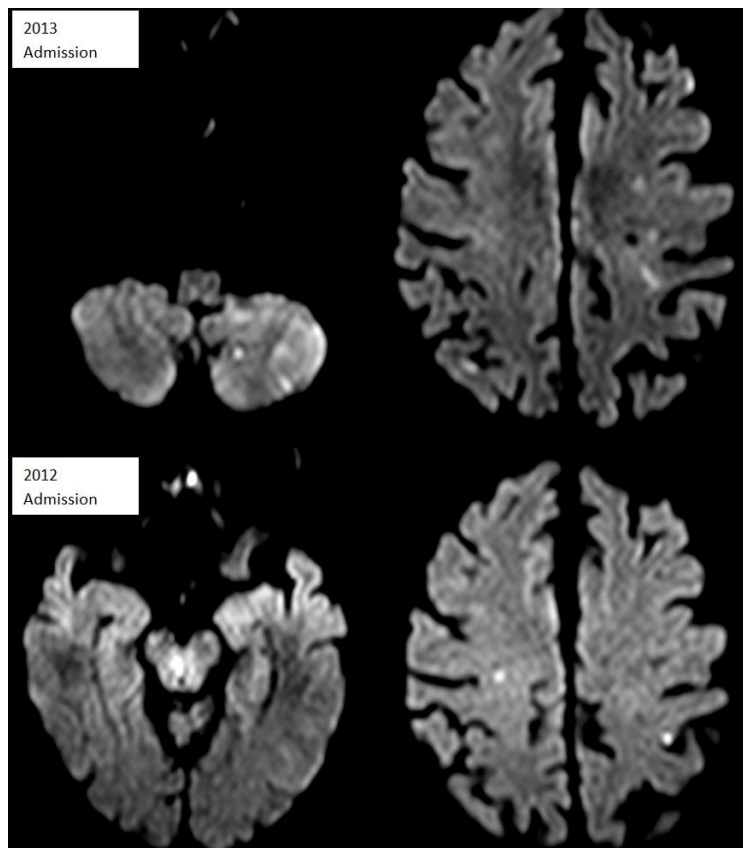
BACKGROUND & PURPOSE: To report an unusual cause of paradoxical embolus. The levo-atrial cardinal vein is an anomalous vein that connects the superior vena cava (SVC) with the left atrium (LA). It is a rare developmental abnormality caused by persistence of primitive connections between the pulmonary venous primordial and the cardinal vein. Stroke secondary to the levo-atrial cardinal vein has not been previously reported.

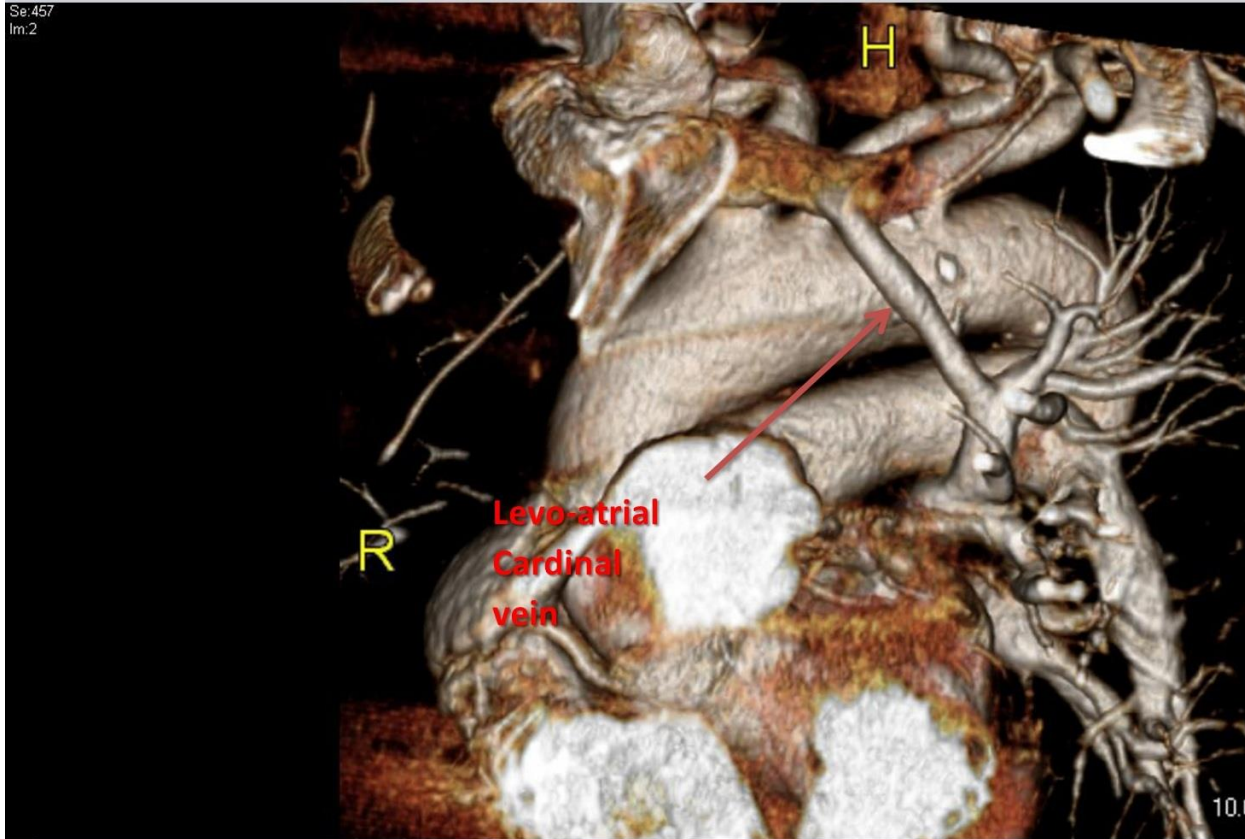
METHODS: Case report from a tertiary care medical center.

RESULTS: An 80-year-old man presented with dizziness with INO on examination. MRI revealed bi-hemispheric and brainstem infarcts. Cardioembolic source was suspected however initial workup was unrevealing and was given the diagnosis of cryptogenic stroke. One year later returned with right hemiparesis. MRI revealed bi-hemispheric and cerebellar infarcts. Repeat TEE revealed an unusual pattern of flow, with immediate filling of the LA followed by right sided filling, concerning for venous-arterial

connection. Chest CT showed abnormal connection of the left brachiocephalic vein to the LA: a levo-atrial cardinal vein. Search for paradoxical embolus revealed superficial vein thrombosis of the upper extremity. He was started on anticoagulation without stroke recurrence.

CONCLUSIONS: This case illustrates the importance of proper investigation of bilateral hemispheric infarcts with the use of the echocardiogram with bubble study. Immediate LA bubbles followed by right sided bubbles are the atypical flow pattern seen in levo-atrial cardinal vein. This case illustrates that unusual flow patterns seen on echocardiogram should prompt chest imaging in search of structural anomalies.





6. DON'T LOOK THE OTHER WAY: BOW HUNTER'S SYNDROME – AN UNSUAL CAUSE OF POSTERIOR CIRCULATION STROKE

Neville Jadeja, Krishna Nalleballe, Neha Mirchandani, John Hanna, Kathryn F Kirchoff-Torres

Montefiore Medical Center & Albert Einstein College of Medicine New York, NY, USA

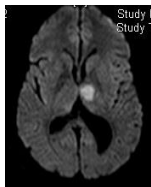
BACKGROUND & PURPOSE: *Bow Hunters syndrome is a rare cause of symptomatic vertebrobasilar ischemia that results from a mechanical compression or injury to the vertebral artery.*

METHODS: *We describe a case of Bow Hunters syndrome secondary to congenital cervical spine abnormalities.*

RESULTS: An otherwise healthy 24 year old man presented with one week of intermittent dizziness exacerbated by turning his head to the left, followed by diplopia and disorientation on the day of presentation. He reported similar

complaints a few months prior. There was no history of neck trauma. His examination demonstrated mild right hemiparesis. Head CT showed congenital nonunion of C1 and fusion of C2–C3 vertebrae. CT angiography of the head showed subacute injury to the right vertebral artery as it exited the C2 transverse foramen evidenced by a focal irregularity in the arterial lumen with pseudoaneurysm formation confirmed by MR angiography. Brain MRI showed restricted diffusion in the left anterior thalamus and bilateral dorsal midbrain indicative of acute infarcts. Chronic infarcts in the right cerebellum and left thalamus were also present indicative of prior ischemia. Dynamic x-ray showed malalignment of lateral masses of the atlas with C2, but no instability. A diagnosis of Bow hunters Syndrome was made. He was started on aspirin for secondary stroke prevention and was referred for evaluation for corrective cervical spine surgery.

CONCLUSIONS: Posterior circulation strokes in young adults with evidence of high cervical spine abnormalities on imaging must alert the clinician to the possibility of dynamic vertebral artery compression. Surgical correction of the bony abnormality can be potentially curative.



7. Atrioesophageal Fistulas after Pulmonary Vein Isolation: a rare and deadly complication

Abhishek Purohit¹, Zain Guduru¹, Sonja Chaparala¹, Ashis Tayal^{1,2,3}

¹Allegheny General Hospital Pittsburgh, PA, USA, ²Drexel School of Medicine

Philadelphia, PA, USA, ³Temple School of Medicine Philadelphia, PA, USA

BACKGROUND & PURPOSE: Atrioesophageal fistula (AEF) is a rare but highly morbid complication of pulmonary vein isolation (PVI). Its presentation can include GI bleeding, sepsis, seizures, meningitis and embolic strokes. Complications of AEF can be seen from 3 to 40 days after the procedure and diagnosis is essential to the survival of patients. We present a case of a patient who had embolic strokes 4 weeks after PVI initially felt to be due to praxaxa failure but found to have an AEF at autopsy.

METHODS: 63 y/o female with past medical history of refractory paroxysmal afib on praxaxa presented with left hemiparesis four weeks after PVI. Imaging revealed embolic strokes in the right MCA territory. While admitted, she had a GTCS followed by significant decompensation of her neurologic exam, later requiring intubation. Based on imaging she was taken for a STAT decompressive craniectomy, however, after the procedure, she continued to swell and family decided to withdraw care. At autopsy, findings were consistent with an AEF.

RESULTS: MRI brain revealed scattered strokes primarily in the R MCA territory. CTHs show a development of large areas of stroke with midline shift, herniation and development of pneumocephalus due to air embolus.

CONCLUSIONS: Prompt diagnosis of an AEF is paramount due to the devastating effects it may have. Neurologists must be aware of this complication of PVI. Patients with a recent PVI who present with neurologic symptoms should be evaluated by the performing physician. They may also benefit from a cardiothoracic evaluation or direct visualization by endoscopy.

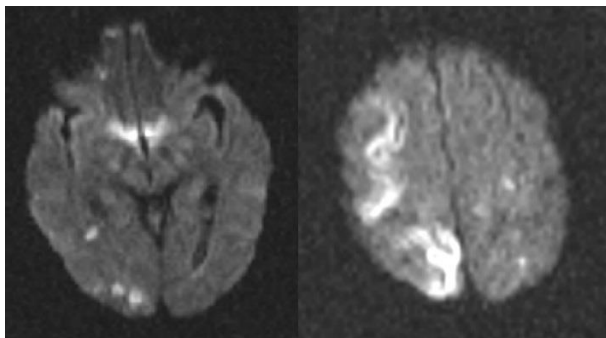


Fig. 1: When patient was initially admitted with complaints of L hemiparesis. MRI revealed bilateral embolic appearing strokes which were primarily in the R MCA territory.

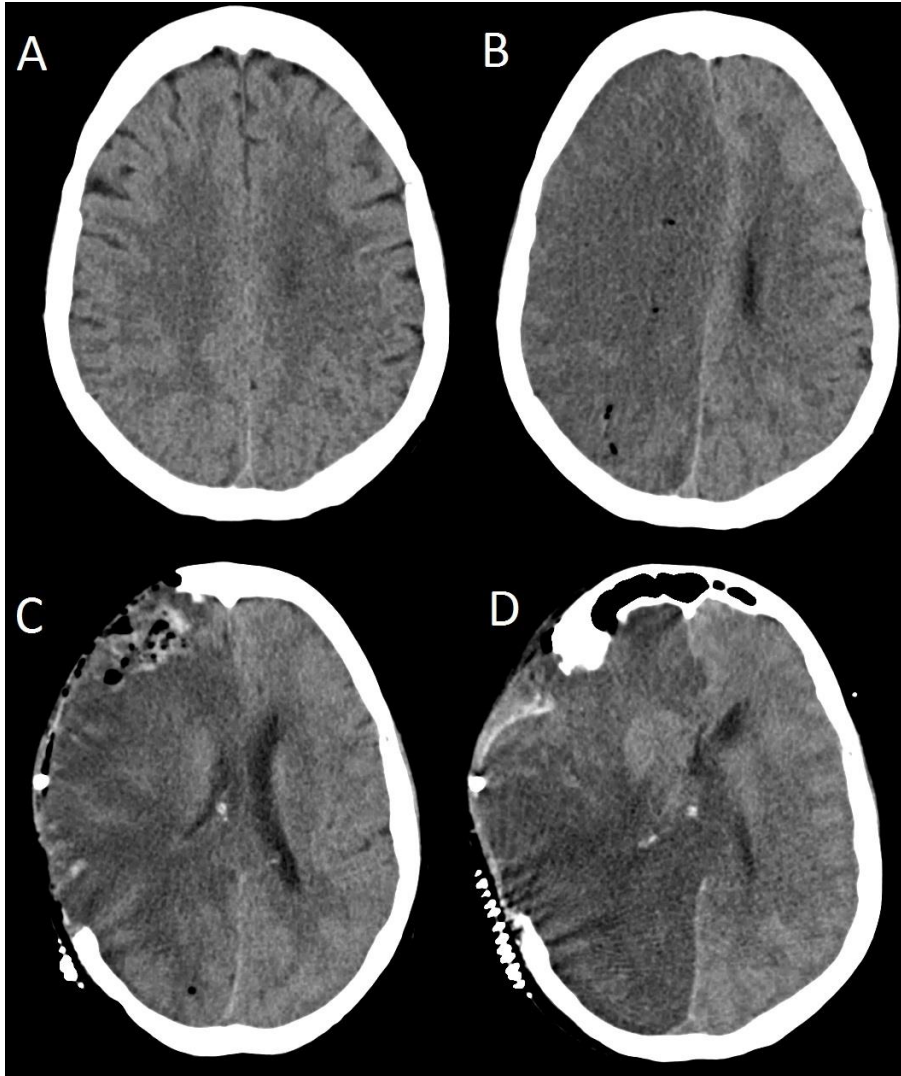


Fig. 2: Sequence of CTHs showing the development of edema and pneumocephalus due to an air embolus over the course of less than 24 hours. A: CTH done after a GTCS showing areas of ischemia seen on previous MRI Brain. B: Later in the day patient decompensated and needed intubation, CTH showed R MCA/ACA strokes with edema, midline shift and new pneumocephalus. C+D: Despite decompressive craniectomy, the patient continued to have development of edema with midline shift.

8. Langerhans Cell Histiocytosis Presenting as a Meningioma on MRI

Madhureeta Achari², Cesar E. Escamilla Ocanas¹

¹Uniersided de Monterey Monterey, Mexico, ²University of Texas Medical School Houston Department of PM &R Houston, TX, USA

BACKGROUND & PURPOSE: Meningiomas, symptomatic and incidental, are found

commonly on MRI, with characteristic MRI findings. Langerhans Cell Histiocytosis (LHC) is a rare systemic granulomatous disease with CNS involvement noted in 16% of cases, mainly involving the posterior pituitary gland, causing diabetes insipidus. Although meningeal forms of LHC have been reported, they are rare. We present a rare case of Langerhans Cell Histiocytosis presenting as a meningioma on MRI.

METHODS: The patient is a 28 year old female with a history of common migraine, who developed progressive left hemicranial headaches, similar to her migraines, unresponsive to her usual therapeutic regimen. She is otherwise healthy. She had mild tenderness to palpation over the left frontal cranium otherwise, her neurological examination was normal. Contrast enhanced MRI of the brain revealed an extra-axial, enhancing lesion with a dural tail in the left frontal region, suggestive of meningioma. The patient underwent tumor excision without complications.

RESULTS: The surgical histopathology revealed the lesion to be composed of dendritic (Langerhans) cells with eosinophilia involving the bone, epidural tissue and dura. Immunohistochemical studies of S-100 and CD1a results were positive for atypia. A total body evaluation did not reveal LHC in other sites. After surgical excision, the patient was headache free for 12 weeks, and then returned to her usual migraine frequency and pattern.

CONCLUSIONS: Meningiomas are common findings on MRI, and may be incidental. Meningeal lesions are a rare finding in LHC. We present a case with LHC presenting with typical features of a meningioma on MRI. This enhances the differential diagnosis of meningeal lesions and underscores the importance of neuroimaging in headache patients.

10. Neuroimaging of Hemophagocytic lymphohistiocytosis

Ajay Goenka, Krishna Nalleballe, Fatema Malbari

Montefiore Medical Center & Albert Einstein College of Medicine New York, NY, USA

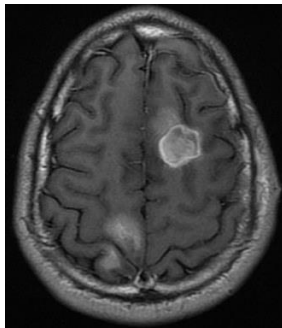
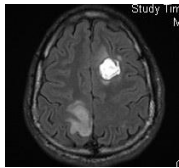
BACKGROUND & PURPOSE: To describe the MRI findings in a case of CNS Hemophagocytic lymphohistiocytosis (HLH). Familial CNS Hemophagocytic

lymphohistiocytosis (HLH) is a rare aggressive life threatening disease characterized by overactive immune function (excessive proliferation and infiltration of benign histiocytes). We report the MRI findings in a case of CNS HLH that showed multiple enhancing lesions mimicking demyelinating lesion.

METHODS: This is a 17 year-old boy who presented with multiple seizures and left foot drop. As part of the initial evaluation, neuroradiological studies confirmed CNS involvement. He underwent extensive work up including a brain and bone marrow biopsy as well as a genetic evaluation which confirmed the final diagnosis of HLH.

RESULTS: MRI brain showed multiple diffuse enhancing lesions. Pathology was suggestive of a marked inflammatory process with lymphohistiocytic infiltrate. Final diagnosis was made when mutations in the PRF 1 gene were detected in the patient and the mother. He underwent bone marrow transplantation with partial resolution of the CNS lesion.

CONCLUSIONS: Our case emphasizes the importance of considering a diagnosis of familial Hemophagocytic lymphohistiocytosis in complex enhancing brain mass lesions. It also emphasizes the importance of genetics as a strong diagnostic tool for familial HLH.



11. Orbital Abscess: A Delayed Complication of Decompression for Proptosis Secondary to Grave's Ophthalmopathy

Reena T Gottesman¹, Kunal V Desai^{1,2}, Jessica L Zwerling¹

¹Albert Einstein College of Medicine/Neurology Bronx, NY, USA, ²Jacobi Medical

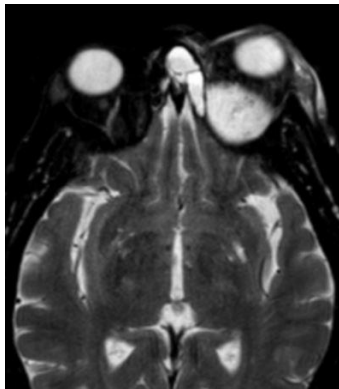
Center/Neurology Bronx, NY, USA

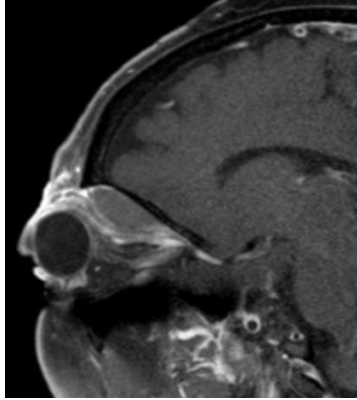
BACKGROUND & PURPOSE: Orbital abscess can be a life threatening infection that must be identified early to prevent complications like meningitis, blindness and death. It is an essential part of the differential diagnosis for proptosis and must also be considered in patients with known Graves ophthalmopathy.

METHODS: A 60 year old woman presented to the ER with 4 days of progressive, severe, left periorbital headache, diplopia and blurry vision. Her headache was worsened by coughing and did not respond to naproxen. She carried a diagnosis of Graves ophthalmopathy and had undergone endoscopic decompression for left eye proptosis 6 years prior to her current presentation. Her immediate post-operative course was complicated by a cerebrospinal fluid leak. A temporary lumbar drain was placed which led to the resolution of the patient's symptoms at that time.

RESULTS: On the current presentation, she had normal vital signs and was afebrile. Her exam showed left eye proptosis, periorbital edema, bilateral conjunctival injection, blurring of the optic discs bilaterally, 3rd and 6th cranial nerve palsies and a diminished corneal reflex. Her initial blood work was unremarkable. Contrast enhanced MRI of the orbits showed a fluid collection in the left orbit in communication with the left ethmoid and frontal sinuses consistent with a subperiosteal abscess without intracranial extension. The abscess was drained endoscopically and the patient was treated with intravenous antibiotics with resolution of her symptoms.

CONCLUSIONS: This case illustrates the importance of imaging in assisting with the diagnosis of orbital abscess in a patient with Graves ophthalmopathy.





12. Diffuse Axonal Injury in the Corpus Callosum Relates to Long-Term Neuropsychological Functioning and Clinical Outcome in Severe Traumatic Brain Injury Patients

Adrienne Hezghia^{1, 2}, Blandine Lesimple³, Clara Debarle⁴, Elsa Caron⁴, Sebastien Delphine², Mélanie Péligrini-Issac², Damien Galanaud⁵, Habib Benali², Louis Puybasset^{2, 3}, Pascale Pradat-Diehl^{2, 4}, Vincent Perlberg^{2, 6}

¹University at Buffalo School of Medicine and Biomedical Sciences Buffalo, NY, USA, ²Sorbonne Universités, UPMC Univ Paris 06, CNRS, INSERM, Laboratoire d'Imagerie Biomédicale (LIB), F-75013 Paris, France, ³Assistance Publique-Hôpitaux de Paris, Groupe Hospitalier Pitié-Salpêtrière, Department of Anesthesiology and Intensive Care, F-75013 Paris, France, ⁴Assistance Publique-Hôpitaux de Paris, Groupe Hospitalier Pitié-Salpêtrière, Department of Physical and Rehabilitation Medicine, F-75013 Paris, France, ⁵Assistance Publique-Hôpitaux de Paris, Groupe Hospitalier Pitié-Salpêtrière, Department of Neuroradiology, F-75013 Paris, France, ⁶Brain and Spine Institute (ICM), Institute for Translational neurosciences (IHU-A-ICM), Bioinformatics and Biostatistics Platform, F-75013 Paris, France

BACKGROUND & PURPOSE: Death and disability due to a traumatic brain injury (TBI) is a significant global public health concern. Severe TBI involves treatment in intensive care units and may lead to long-term disability characterized by a broad range of cognitive, behavioral, and functional impairments. Neuroanatomical damage after a TBI is most commonly characterized by widespread microscopic lesions to white matter, known as diffuse axonal injury

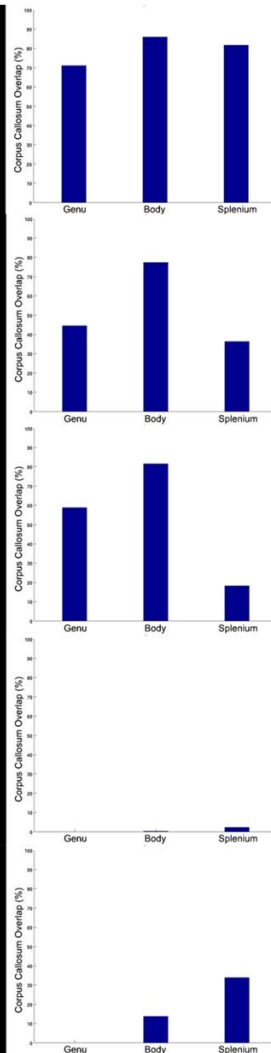
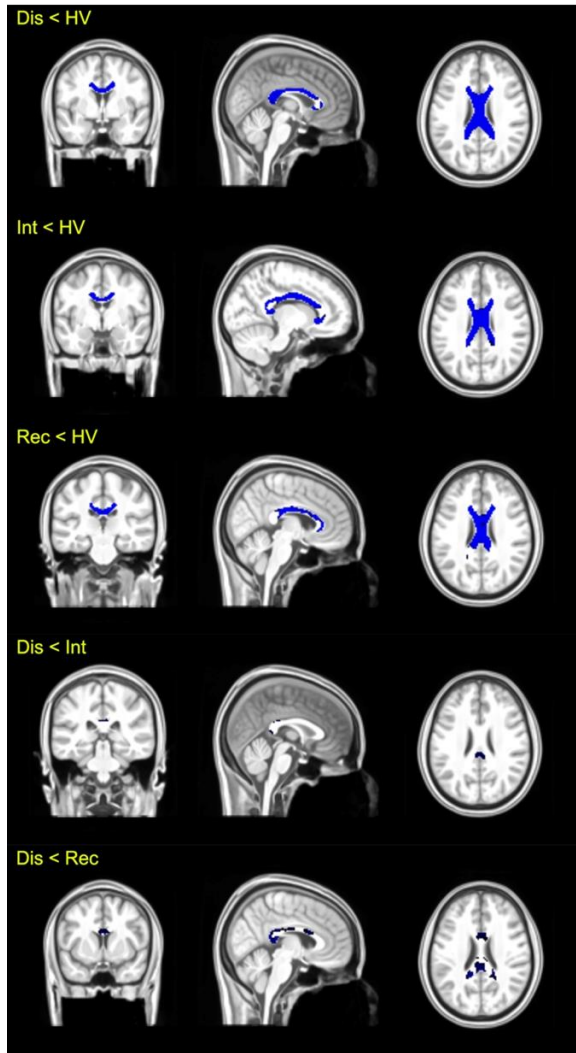
(DAI). As the largest white matter bundle in the brain, the corpus callosum is one of the structures most susceptible to DAI.

METHODS: 54 adult severe TBI patients at least 3 years post-injury participated in neuropsychological examination and multimodal neuroimaging. Patients were categorized as disabled, intermediate, and recovered based on their extended Glasgow Outcome Scale (GOSE) score. 22 healthy volunteers participated in neuroimaging only. The corpus callosum was divided into the genu, body, and splenium. Diffusion tensor imaging (DTI) was used to assess white matter integrity in the corpus callosum by calculating fractional anisotropy (FA) and mean diffusivity (MD). Spearman's Rank-Order correlations between neuropsychological domains and DTI metrics were analyzed.

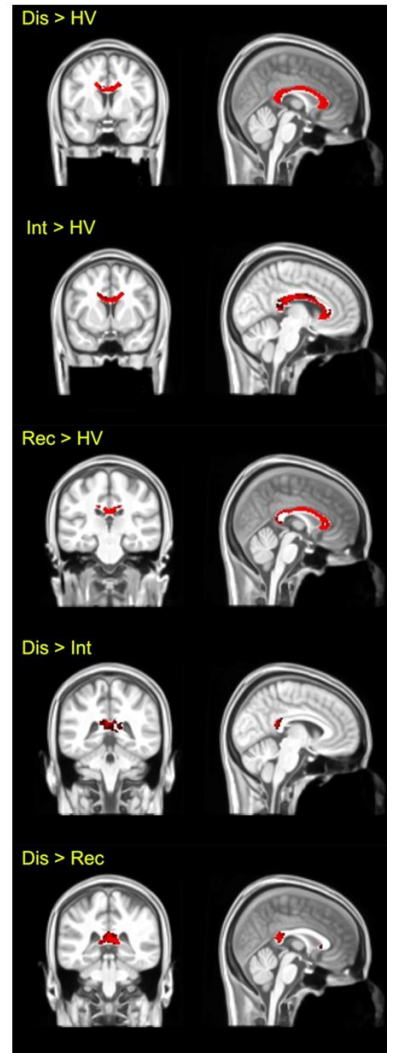
RESULTS: All patients had robust and widespread DAI in the corpus callosum as indicated by decreased FA and increased MD compared to healthy volunteers. The extent of DAI in the splenium related to long-term clinical outcome and neuropsychological impairments in executive functioning, anterograde episodic memory, and verbal fluency.

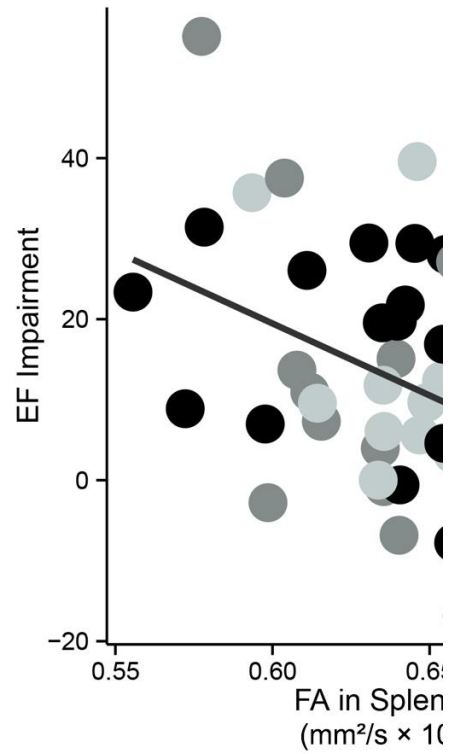
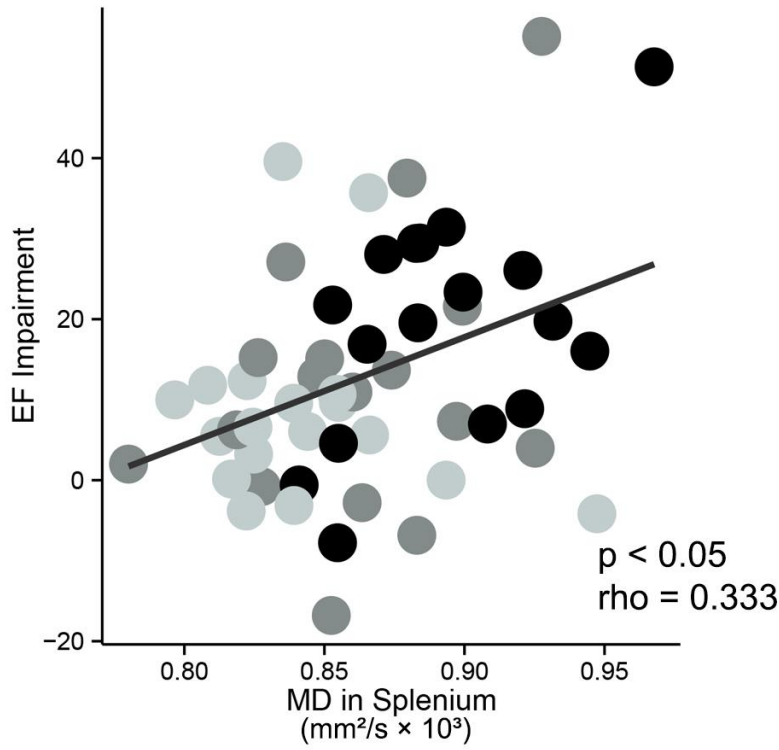
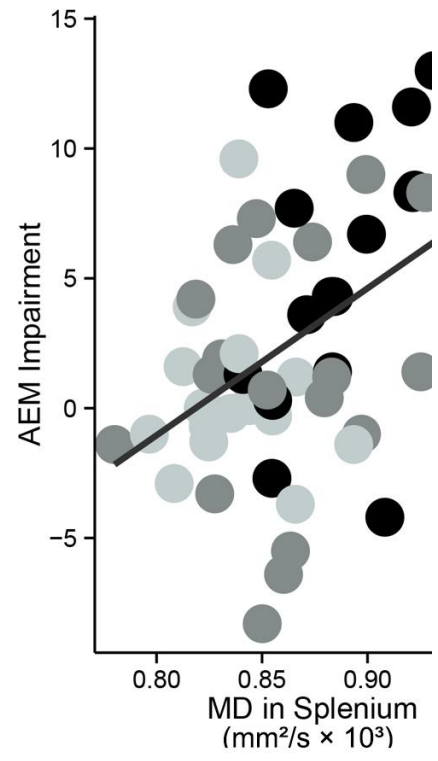
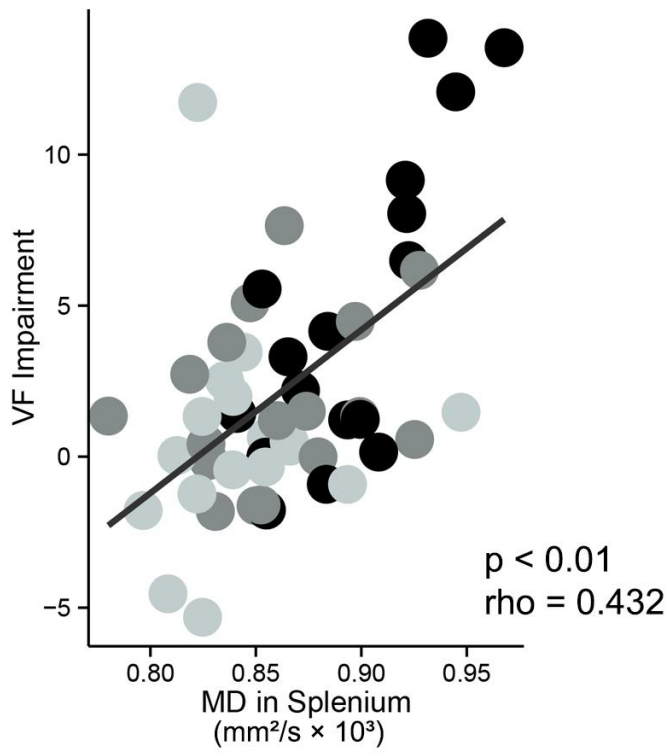
CONCLUSIONS: Increased DAI in the splenium of the corpus callosum relates to poor outcome after a severe TBI. Greater damage to this region could reflect larger impact to the head.

A



B





13. Hippocampal Hemorrhage in a 25-year-old Male Post Cardiac Arrest

Tracy L Huffstatler^{1,3}, Mark D Malkoff²

¹Methodist LeBonheur Healthcare–University Hospital Memphis, TN, USA,

²University of Tennessee Health Science Center–Department of Neurology

Memphis, TN, USA, ³University of Tennessee Health Science Center, College of Nursing, Advanced Practice and Doctoral Studies Memphis, TN, USA

BACKGROUND & PURPOSE: The brain is the organ in the body most susceptible to hypoxic injury. Hippocampal neuronal loss seen on magnetic resonance imaging (MRI) is a common finding in hypoxic–ischemic injury from cardiopulmonary and respiratory arrest, status epilepticus, as well as myoclonus. We report an interesting case of hemorrhage in bilateral hippocampal regions on MRI in a patient with global anoxic brain injury status post ventricular fibrillation cardiac arrest with resulting myoclonus.

METHODS: Case report and neuroimaging.

RESULTS: A 25-year-old Caucasian male with a past medical history of refractory alcohol and heroin abuse presented to the emergency department via emergency medical service (EMS) after a prolonged ventricular fibrillation arrest with subsequent return of spontaneous circulation. His urine screened positive for opiates. Therapeutic hypothermia was initiated and Neurology was consulted for management of myoclonus and neurological prognostication post cardiac arrest. The patient also demonstrated profound acute liver injury, coagulopathy, septic shock secondary to aspiration pneumonia, refractory lactic acidosis, and acute kidney injury requiring hemodialysis. Magnetic resonance imaging done 72 hours post cardiac arrest showed global supratentorial ischemic injury and subacute infarction, as well as subacute infarction present in both cerebellar hemispheres compatible with a global ischemic injury pattern, in addition to secondary hemorrhagic type change in both hippocampal formations with lateral ventricular subependymal and intraventricular hemorrhage.

CONCLUSIONS: We present a unique case of hemorrhage into the hippocampal and intraventricular areas in a young patient status post cardiac arrest.

14. Neuro–Behçet’s disease masquerading as Brain abscesses on MRI

Haris Kamal ¹, Gil I Wolfe¹, Muhammad U Hafeez¹, Aisha Bushra¹, Karanbir Singh ², Nicholas J Silvestri¹

¹Department of Neurology SUNY Buffalo Buffalo, NY, USA, ²Dent Neurologic Institute Buffalo, NY, USA

BACKGROUND & PURPOSE: We present a unique case of Neuro–Behçet's disease presenting with brainstem lesions resembling bacterial abscesses that along with her antecedent fevers and headaches initially created diagnostic uncertainty.

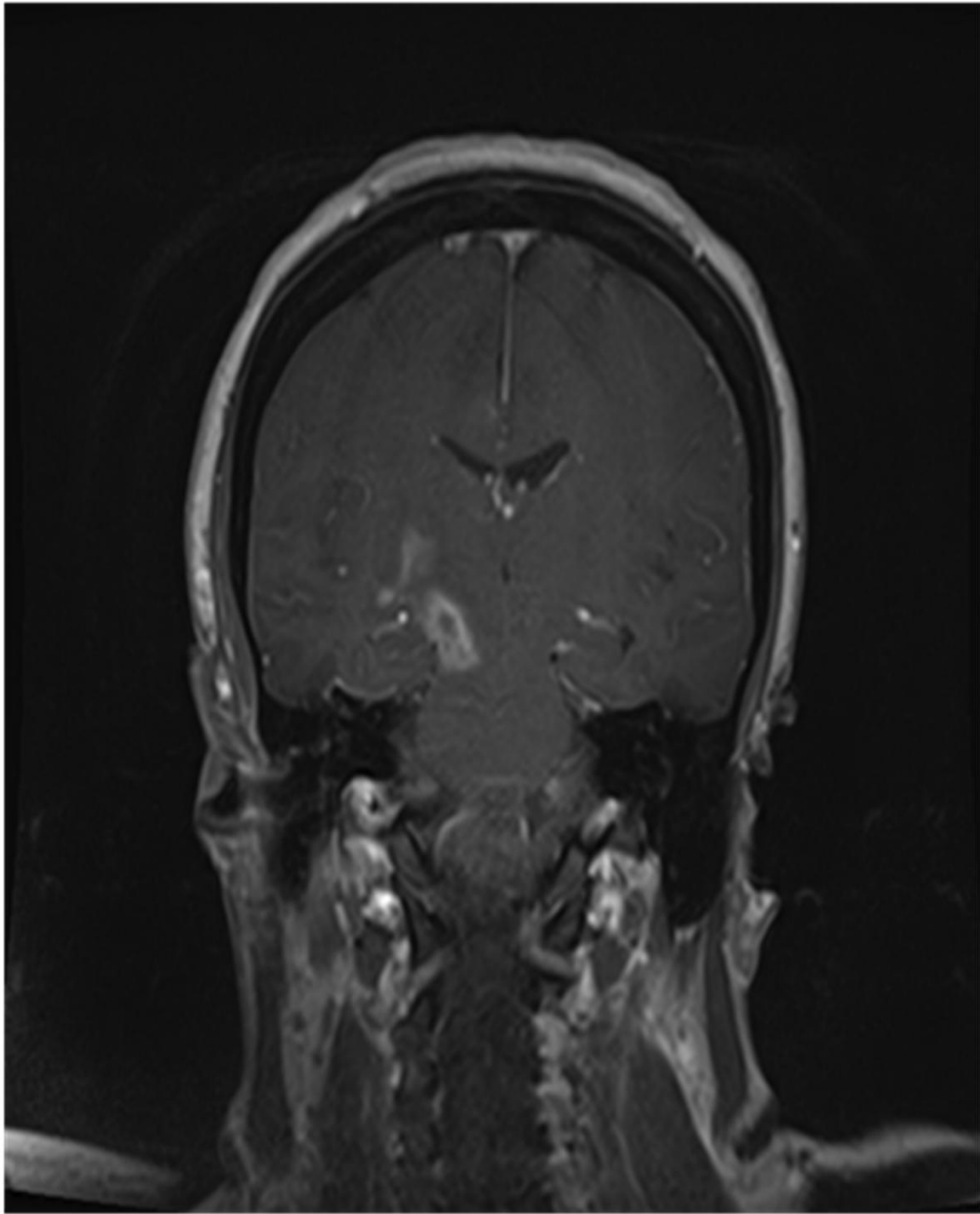
METHODS: Case:44 year old woman presented with sudden onset left hemiparesis and facial droop. She reported fever for 4 days and persistent holocephalic headaches. On exam, she was febrile (39C), and had left facial weakness and hemiparesis of MRC grade 1.

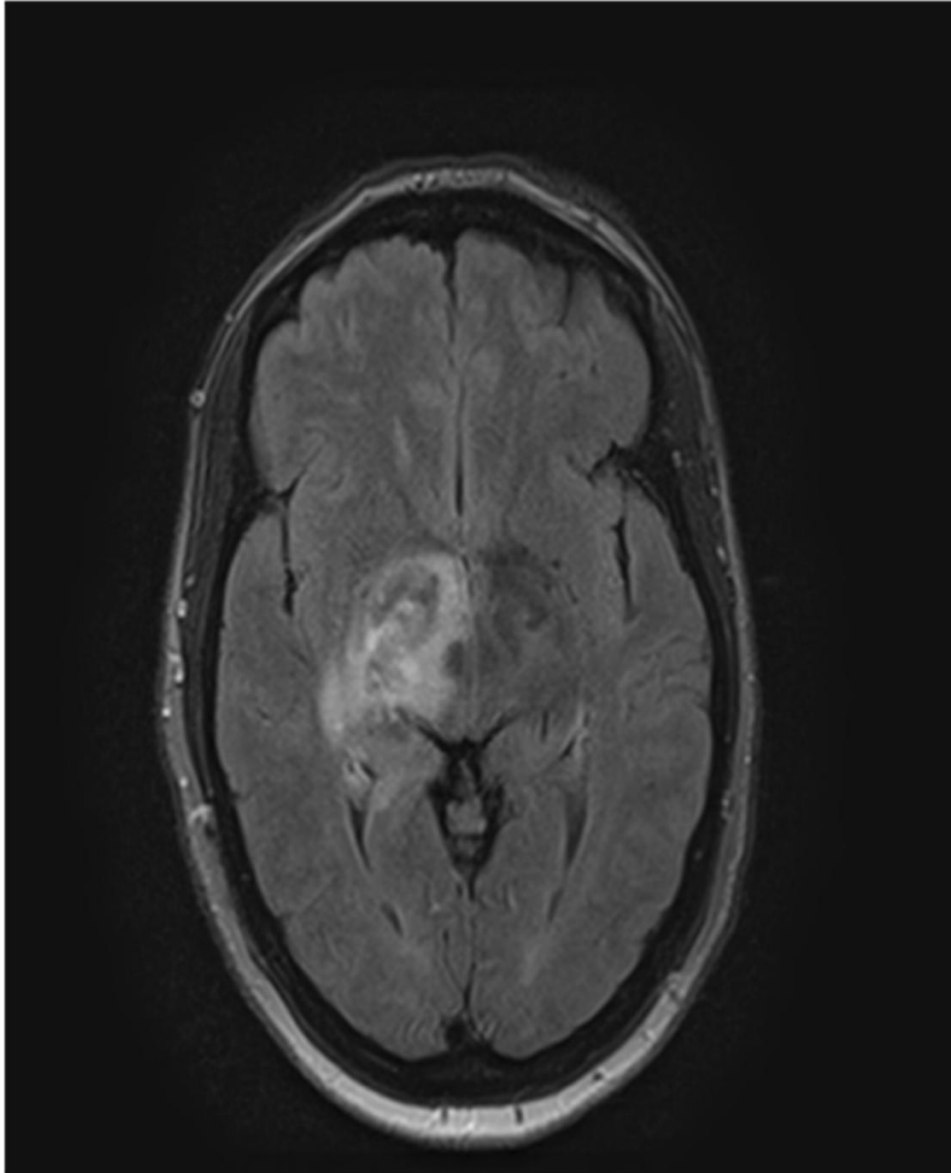
CSF analysis revealed 1485 WBC/mm³, protein 60mg/dl, glucose 43mg/dl. MRI revealed extensive FLAIR hyperintensities and ring enhancing lesions post–contrast in the right internal capsule with extension into the cerebral peduncle, pons and thalamus. There was restricted diffusion in patchy areas in the brainstem, splenium, thalamus and internal capsule. The patient was given broad–spectrum antibiotics over concerns for cerebral abscesses. The patient had persistent symptoms despite 7 days of treatment.

Further history disclosed intermittent oral and genital ulcers with arthritis that responded to steroids but the patient was never diagnosed with Behçet's.

RESULTS: A diagnosis of Neuro–Behçet's disease (NBD) was made and she was treated with steroids. Her headaches and left leg strength improved over the next few weeks. Repeat MRI revealed complete resolution of FLAIR hyperintensities in the thalamus, peduncles and brainstem. A small persistent abnormality in the internal capsule remained 2 months after tapering steroids.

CONCLUSIONS: NBD can present with acute neurological deficits, headaches and fevers. Initially the lesions may resemble unruptured cerebral abscesses due to ring enhancement and positive diffusion weighed imaging. Knowledge of this imaging finding may hasten diagnosis of NBD.





15. Spinal MRI Leading to the Accurate Diagnosis and Appropriate Management of Spinal Dural Arteriovenous Fistula Related Myelopathy

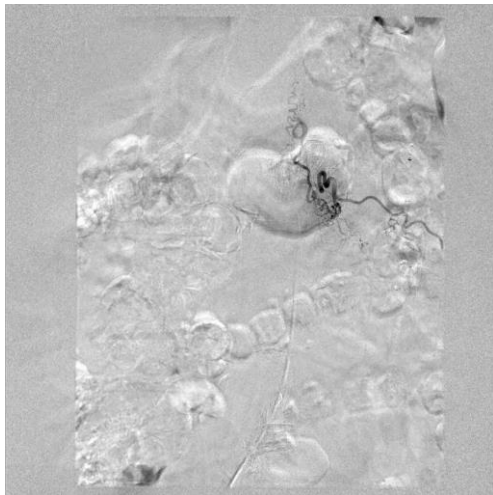
Tasleema Khan, Chetan Gandhi, Derrick Robertson, Alfred Frontera
University of South Florida Tampa, FL, USA

BACKGROUND & PURPOSE: Spinal dural arteriovenous fistula (SDAVF) is an uncommon but treatable cause of myelopathy. Here we report a case of chronic progressive myelopathy where appreciation of flow voids on spinal MRI and subsequent spinal angiography led to the correct diagnosis of SDAVF and appropriate neurosurgical management.

METHODS: 68-year-old woman presented with progressive shooting pain/numbness and weakness of her bilateral legs and urinary retention over 7 months. Examination revealed paraparesis, hypoesthesia below L1 dermatome, and bilateral lower extremity hyperreflexia.

RESULTS: Extensive laboratory workup including serum and cerebral spinal fluid studies for infectious, inflammatory and neoplastic processes were unremarkable. MRI thoracic/lumbar spine revealed intramedullary enhancement from T7 to the conus. Upon further review, we identified prominent, circular T2 hypointensities in dural vessels consistent with flow voids, concerning for a SDAVF. This was subsequently confirmed on spinal angiogram. The patient underwent resection of the SDAVF resulting in significant improvement of her leg strength and bladder function.

CONCLUSIONS: This case demonstrates how careful review of spinal MRI led to the proper diagnosis of SDAVF, a reversible cause of myelopathy. The multi-level intramedullary enhancement was a consequence of venous congestion resulting in cord edema and caused the patient's neurological deficits. The appearance of perimedullary flow voids represented spinal venous dilatation, a repercussion of elevated venous pressure generated from the fistula. Vigilant clinical correlation of prominent T2 hypointensities characterizing venous flow voids was crucial to the accurate diagnosis and successful treatment of the patient. Without neurosurgical intervention, this patient was at risk of irreversible paraplegia or spinal cord infarction.



16. Characterization of spatiotemporal changes in local cerebral cortical complexity across the adult human lifespan

Sourav R. Kole¹, Carena A. Kole¹, Denise C. Park², Richard D. King¹

¹University of Utah/Center for Alzheimer's Care, Imaging, and Research Salt Lake City, UT, USA, ²University of Texas/Center for Vital Longevity Dallas, TX, USA

BACKGROUND & PURPOSE: Advances in post-imaging analysis of human brain magnetic resonance (MR) images enabled the quantification of fractal dimension (a measure of shape complexity) of the human cerebral cortex at a local level. The purpose of this paper is to characterize the spatiotemporal distribution of changes in fractal dimension on a lobar and regional scale

across the adult human lifespan in a large, healthy, cross-sectional database (N=301, age range: 20–88).

METHODS: High-contrast MR scans (MP-RAGE format) were downloaded from the Dallas Lifespan Brain Study. Semi-automated image segmentation, parcellation, and cortical labeling were done using FreeSurfer. Fractal dimension was computed for every cortical voxel using custom software. Cortical labels were aligned with the fractal dimension maps, and aggregate statistics were generated using MATLAB.

RESULTS: A linear decrease in cortical complexity across the adult human lifespan at both, the lobar- and regional-level, was observed. Variable effects on the cortex, with some regions being more selectively prone to age-related atrophy, varied across age ranges. On the regional level, the inferior temporal, inferior parietal, lateral occipital, middle temporal, entorhinal, fusiform, and temporal pole regions of the left hemisphere had the least amount of change in cortical complexity across the adult human lifespan. In contrast, the superior frontal, isthmus cingulate, posterior cingulate, and lingual regions had the greatest amount of change in cortical complexity across the adult human lifespan.

CONCLUSIONS: This reference of normal spatiotemporal pattern of cortical shape complexity can be used as a comparative biomarker to identify individuals at risk for neurodegenerative disease, such as Alzheimer's disease.

17. Predicting cognitive impairment in active professional fighters using multimodal MRI

Virendra Mishra, Xiaowei Zhuang, Karthik Sreenivisan, Sarah Banks, Dietmar Cordes, Charles Bernick

Cleveland Clinic Lou Ruvo Center for Brain Health Las Vegas, NV, USA

BACKGROUND & PURPOSE: The Professional Fighters' Brain Health Study (PFBHS) is an observational longitudinal study of active professional fighters to investigate the effect of repetitive head trauma. In this abstract, we report the results of machine learning approach on finding the predictors of cognitive impairment from multimodal MRI data of 206 non-impaired and 99 impaired

fighters.

METHODS: 305 fighters (149/156 boxers/MMA) underwent 71 directions (b-value 1000 s/mm²) diffusion weighted imaging and T1-MPRAGE scans on a 3T Siemens Verio at the first visit. 206/305 fighters were categorized as "non-impaired" based on their psychomotor speed (PSYCHOSTANS) and processing (PSTANS) speed. 73/305 (49 non-impaired) fighters were scanned again atleast after 1 year. A combination of structural measurements, diffusion derived measurements (FA, AD, RD and MD), gender, age, years of education, years of professional fighting and type of fighter were used as features for supervised machine learning using LASSO and Radial Basis Functional Networks (RBFN). The distinguishing features between impaired and non-impaired groups were analyzed for the longitudinal cohort.

RESULTS: FMajor FA, left Inferior Longitudinal Fasciculus (ILF) FA and left thalamic volume found to be predictors of impairment in the active fighters showed a significant decline ($p < 0.05$) in their measured value from baseline to 1st timepoint (Fig.1) and showed a linear relationship with change of PSTANS and PSYCHOSTANS (Fig.2).

CONCLUSIONS: Multimodal MRI and machine learning approach shows that left thalamic volume combined with FA of FMajor and left ILF are strong predictors of cognitive impairment in active professional fighters.

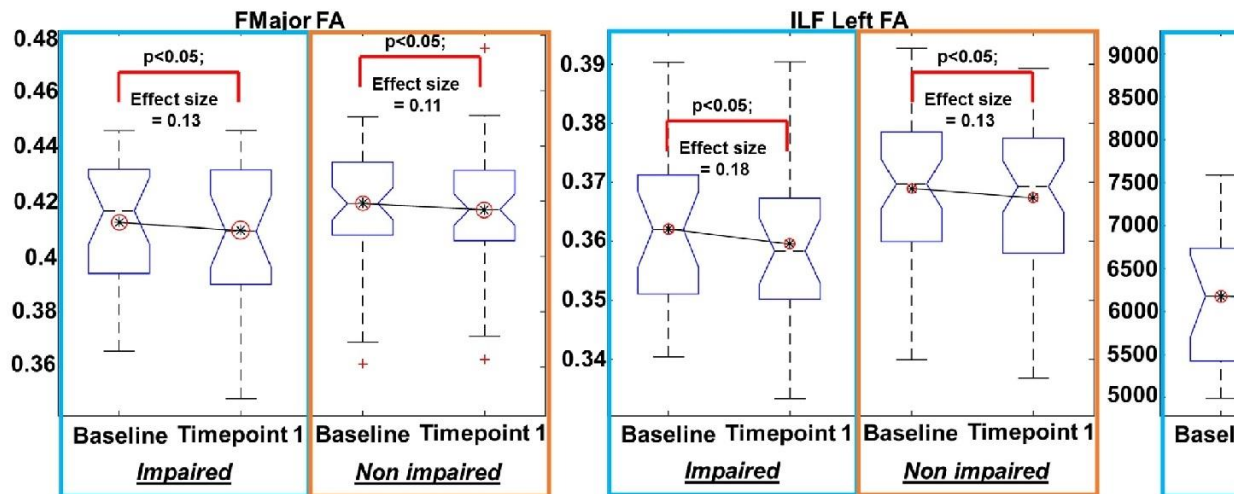


Fig.1: Boxplot of 24 impaired (blue box) and 49 non impaired fighters (orange box) at baseline and timepoint 1 is shown for the 3 features (FA of FMajor, FA of ILF Left and Left Thalamic volume) extracted using machine learning. The mean is represented by the asterisk and standard deviation is shown by the radius of the circle. The change from baseline to timepoint 1 is significantly different ($p < 0.05$) for both impaired and non-impaired fighters.

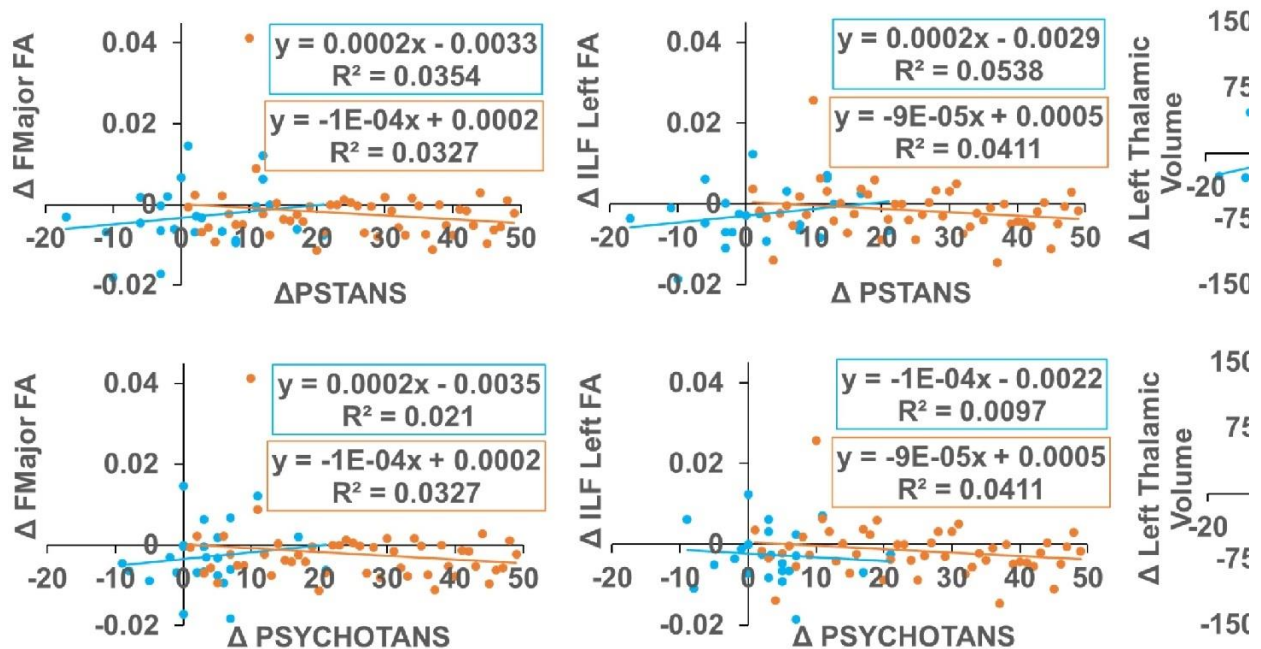


Fig.2: Scatterplot of change (Δ) in all the 3 feature values is shown as a function of change PSYCHOSTANS (bottom panel). The data from the impaired subjects is represented by the blue dots and the non-impaired subjects is represented by the orange dots. The regression line and the R-squared value are shown in orange for non-impaired and blue for impaired subjects. The slope of change in impaired subjects is significantly different ($p < 0.05$) than non-impaired subjects as a function of change PSYCHOSTANS.

18. Apparent diffusion coefficient (ADC) without corresponding diffusion weighted imaging (DWI) changes in posterior circulation stroke

Peggy L Nguyen, Sebina Bulic, May Kim-Tenser

University of Southern California, Department of Neurology Los Angeles, CA, USA

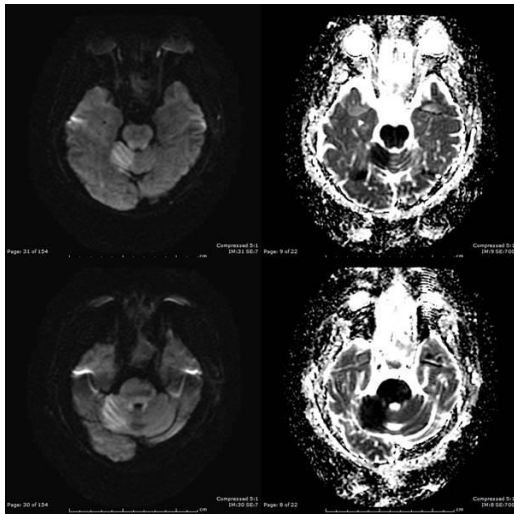
BACKGROUND & PURPOSE: In acute ischemic stroke, cytotoxic edema results in movement of water intracellularly, with decrease in the diffusion characteristics of hydrogen ions. This results in a decrease in the apparent diffusion coefficient (ADC) on magnetic resonance imaging (MRI) and consequently, increased signal on diffusion weighted imaging (DWI). Here, we present a case of stroke with paradoxical mismatch between DWI and ADC.

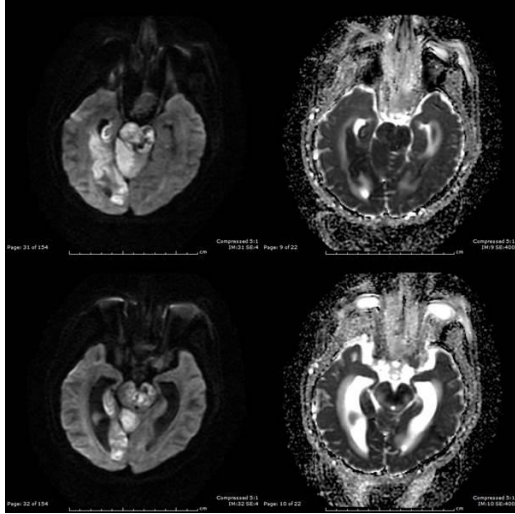
METHODS: Case report

RESULTS: 75 year-old female with history of atrial fibrillation was found to be altered by family 10 hours from her last known well time. MRI brain showed

limited changes on DWI affecting the midbrain, thalami, and right cerebellum compared to the ADC, which showed extensive changes in the cerebellum, midbrain, medulla, pons and thalami (Fig 1). ADC ultimately matched the final infarct territory more accurately on follow up imaging (Fig 2). Patient underwent thrombectomy with successful recanalization but never regained consciousness. Family ultimately opted for comfort care.

CONCLUSIONS: DWI is considered the earliest imaging marker of ischemia, with changes occurring within minutes. The drop in ADC signal should match DWI changes, as both theoretically measure the same molecular changes. There is some data suggesting there may be ADC thresholds that identify at risk-tissue when a DWI to perfusion weighted imaging (PWI) mismatch exists, but to date, no published studies have demonstrated greater sensitivity of ADC in irreversible brain ischemia. Imaging here shows a mismatch between ADC and DWI, with ADC predicting the final territories of infarct, which should prompt further investigation into ADC as an early marker of ischemic penumbra.





20. A Rare Case of a Patient With Hashimoto's Encephalopathy with Abnormal Neuroimaging.

Charles D Schutt, Niraja Suresh, Derrick Robertson
USF Health Department of Neurology Tampa, FL, USA

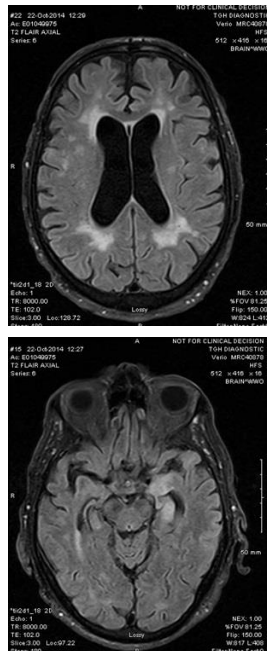
BACKGROUND & PURPOSE: Hashimoto's encephalopathy (HE) typically presents as subacute confusion, myoclonus, movement disorders, psychosis, and/or seizures. Here we present a case of a patient with HE and abnormal MRI findings. (1)

METHODS: A 76 year-old man with hypothyroidism presented with his second episode of acute altered mental status that developed over 1 week. On examination, he was alert and oriented only to self, tangential in his thought process, and unable to follow commands. No additional focal neurological deficits were noted.

RESULTS: MRI brain showed enhancement of the left uncus and hippocampus on T2 FLAIR sequence. Extensive periventricular and subcortical white matter signal was also noted in comparison to prior scans. Pan CT and paraneoplastic workup was negative for malignancy. EEG showed generalized slowing, no seizures. CSF analysis did not reveal an infectious etiology. Free T4 and T3 were depressed and his thyroid microsomal antibody level was 368.01 IU/ML (elevated) consistent with a diagnosis of HE. He received intravenous and oral

steroids and his mental status subsequently improved.

CONCLUSIONS: There is no established diagnostic criteria for HE. Generally, HE presents with vasculitis-like symptoms and/or with progressive cognitive problems (3). While antibodies are frequently present, they are not pathognomonic in HE (2). MRI is typically normal; however, there have been a case reports in the literature that describe leukoencephalopathy-like findings and other cases with limbic encephalitis type findings (1). The disease can rapidly progress from mild cognitive impairment to coma; therefore, timely diagnosis is imperative. MRI can be useful to diagnosis HE.



21. Can brain volume loss be detected during routine evaluation of images in neurologically asymptomatic HIV disease?

Stefan Stojanoski, Mladen Bjelan, Aleksandar Ragaji, Snezana Brkic, Vesna Turkulov, Dusko Kozic

University of Novi Sad faculty of Medicine Novi Sad, Serbia

BACKGROUND & PURPOSE: The prevalence of memory and cognitive symptoms remains evident in persons with HIV. The purpose of this study was to determine if certain regions of the brain become more atrophic in neurologically asymptomatic patients with HIV compared to healthy controls

during routine evaluation of brain MRI.

METHODS: Brain MR imaging was performed in 30 asymptomatic HIV positive examinees and 30 healthy age and sex- matched controls. The following scoring system was used: A) Global cortical atrophy score – GCA: 0: no atrophy, 1: mild atrophy: opening of sulci, 2: moderate atrophy: gyral volume loss, 3: severe atrophy B) Posterior atrophy score of parietal atrophy (Koedam): 0–no atrophy, 1– minimal, 2–moderate and 3–severe C) Medial temporal atrophy score – MTA (Scheltens): 0: no atrophy, 1: widening of choroid fissure, 2: also widening of temporal horn, 3: moderate loss of hippocampal volume, 4: severe volume loss of hippocampus. Drug abusers were excluded from the study.

RESULTS: Statistically significant MTA in clinically asymptomatic patients with HIV was evident using Scheltens score ($p=0.01$ on the left and $p=0.03$ on the right). No significant differences were noted in Koedam score ($p=0.11$) and GCA ($p=0.22$).

CONCLUSIONS: Our results suggest that not only highly sophisticated volumetric imaging methods reveal volume loss of certain brain areas in HIV, but these changes could also be evident during routine evaluation of images. Further neuropsychological correlation is highly recommended in order to recognize which memory symptoms correlate with imaging findings since HIV is becoming more challenging due to increased survival and aging of patients.

22. A Case of Central Nervous System Tuberculosis

Jerry Wei, Neville Jadeja, Krishna Nalleballe

Montefiore Medical Center & Albert Einstein College of Medicine New York, NY, USA

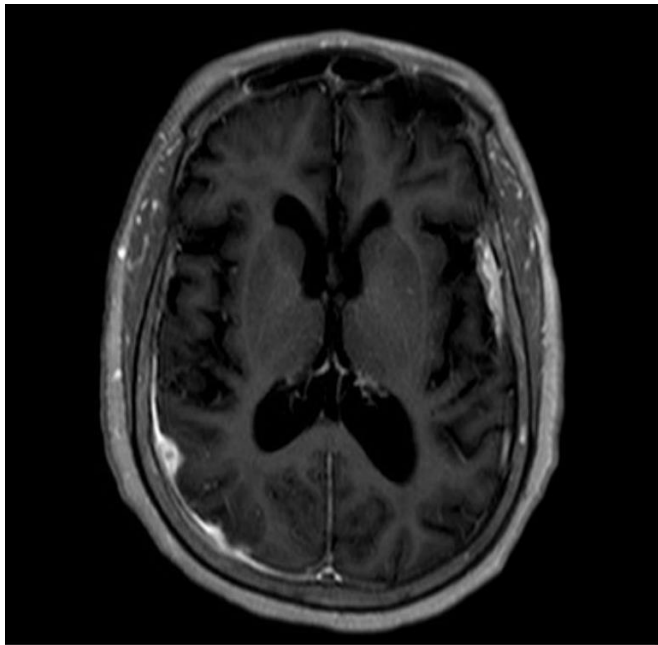
BACKGROUND & PURPOSE: To present a case of central nervous system tuberculosis with interesting findings seen on magnetic resonance imaging.

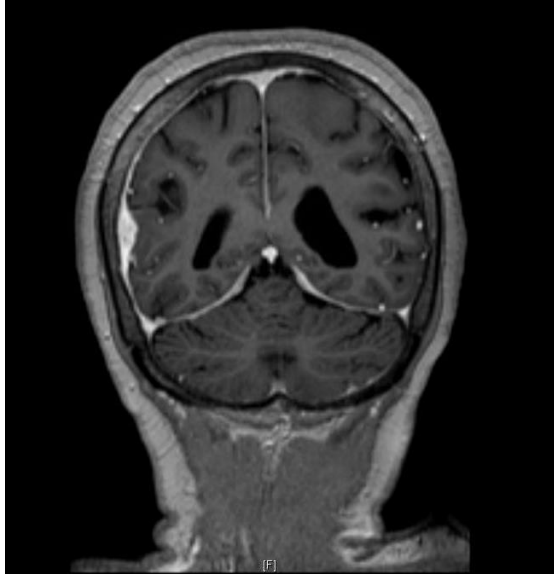
METHODS: 63 year old retired school secretary from Togo, Africa with history of Glaucoma presented with chronic headache and right eye blindness. Her neurologic exam was notable for right ptosis; unreactive right pupil but reactive left pupil, right cranial nerve III, IV, VI palsies, and right lower motor neuron facial palsy. No focal weakness, numbness or dysmetria.

RESULTS: MRI brain with and without contrast showed diffuse dural thickening

and enhancement with areas of nodular enhancement in right posterior temporal and parietal regions as well as in the left anterior temporal region. Routine chest x ray showed right upper lobe cavitory lesion. She underwent needle biopsy of left para-aortic lymph node, showing necrotizing granulomatous inflammation. CSF analysis showed lymphocytic pleocytosis with elevated protein and culture was non diagnostic. HIV screen was negative. She was started on current standard anti tuberculosis drug regimen, her symptoms and imaging finding improved after 6 months.

CONCLUSIONS: Commonly identified neuroradiological features of tuberculous meningitis include basal meningeal enhancement, hydrocephalus, and infarctions in the supratentorial brain parenchyma and brain stem. Central nervous system tuberculosis should remain in the differential diagnosis of a patient presenting with multiple cranial neuropathies and findings of basal meningeal enhancement on neuroimaging.





23. Cerebral hemodynamics during balance system challenges: a transcranial Doppler study

Mohammed Alwatban¹, Benjamin Hage¹, Jessie Patterson¹, Edward Truemper², Julie Honaker¹, Greg Bashford¹

¹University of Nebraska Lincoln, NE, USA, ²Children's Hospital and Medical Center Omaha, NE, USA

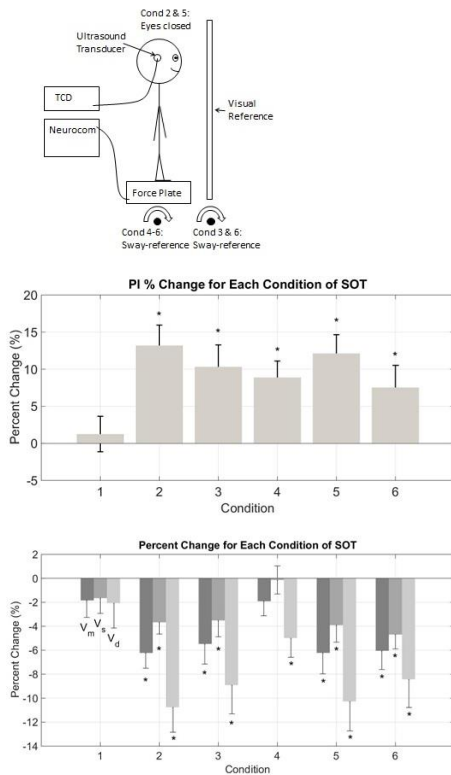
BACKGROUND & PURPOSE: Transcranial Doppler ultrasound (TCD) measures changes in cerebral blood flow (CBF) in response to physiological stimuli. Vestibular researchers use sway data from force plate measurements to assess balance function. This study examines a novel combination of real-time CBF and balance measurements.

METHODS: TCD was used to measure changes in CBF during Sensory Organization Test (SOT) on Computerized Dynamic Posturography. The SOT included six conditions of three variables (Fig. 1): fixed/sway-referenced support, eyes open/closed, and fixed/sway-referenced background. Four hemodynamic parameters were measured: mean (V_m), systolic (V_s), and diastolic (V_d) velocities, and pulsatility index (PI) before and after stimulus.

RESULTS: (Fig. 2) Condition 1 (fixed visual and support) showed no significant change as expected. Otherwise, CBF significantly decreased while PI significantly increased, except for condition 4, where PI increased significantly,

but Vs and Vm did not change significantly. In addition, conditions 2 and 6 (eyes closed) had greatest CBF %change.

CONCLUSIONS: Simultaneous recording of CBF and balance data was demonstrated, with several interesting results. For example, removing proprioception (Cond4) caused an increase in PI without significant change in Vm, possibly due to cerebral autoregulation. However, challenging the visual system alone or in combination with proprioception resulted in an increase in PI and decrease in Vm, possibly because autoregulation was transiently affected. One hypothesis is the need to shunt blood to the vestibular system to maintain upright stance. An application of combining TCD with balance measurements would be measuring cerebral autoregulation changes potentially impacting the balance system in patient populations.



24. Comparison of Conventional Doppler Ultrasound with other Angiographic Modalities in the Measurement of Carotid Artery Stenosis.

Matthew Boyko^{1,2}, Hayrapet Kalashyan², Ashfaq Shuaib², Harald Becher³, Maher

Saqqur², Helen Romanchuk², Khurshid Khan²

¹University of Calgary, Department of Neurology Calgary, AB, Canada,

²University of Alberta, Stroke Program, Department of Neurology Edmonton, AB, Canada, ³University of Alberta, Mazankowski Alberta Heart Institute, Department of Cardiology Edmonton, AB, Canada

BACKGROUND & PURPOSE: Different imaging modalities are being increasingly used to measure Internal Carotid Artery (ICA) stenosis. Doppler Ultrasound (DUS) is commonly used because it is readily available and noninvasive. The purpose of this study was to compare DUS to other modalities: Computed Tomography Angiography (CTA), Magnetic Resonance Angiography (MRA), and the gold standard – Digital Subtraction Angiography (DSA). We hypothesized that DUS performed in a Stroke Prevention Clinic (SPC) and reviewed by a certified stroke neurologist would accurately measure carotid artery stenosis.

METHODS: All DUS studies performed at our SPC from 2011–2013 were included. Other imaging modalities that corresponded to these ICA stenosis measurements were included if performed within 6 months of DUS. Stenosis measurements for DUS, CTA, MRA, and DSA were classified as Normal (1–15%), Mild (16–49%), Moderate (50–69%), Severe (70–99%), or Occlusion (100%).

RESULTS: Overall 490 Doppler studies of single ICAs were identified from 245 patients. Age was 65 ± 13 years and 143 patients were males (58.4%). Sixteen ICAs (3.3%) were excluded because there was no corresponding imaging modalities within 6 months or an intervention was performed prior to imaging. There was very good agreement between DUS and CTA ($\kappa = 0.74$, $n = 276$), good agreement with MRA ($\kappa = 0.67$, $n = 242$), and excellent agreement with DSA ($\kappa = 0.92$, $n = 18$).

CONCLUSIONS: DUS measurements of ICA stenosis were statistically similar to those of CTA, MRA, and DSA. DUS performed in a dedicated SPC and reviewed by a certified stroke neurologist is a powerful and accurate screening tool.

25. Massive Subdural Hematoma in an Infant with Lenticulate Striatal Vasculopathy

Maria Bramhall¹, Paul Maertens¹, Michael Zayek²

¹University of South Alabama/ Neurology Mobile, AL, USA, ²University of South

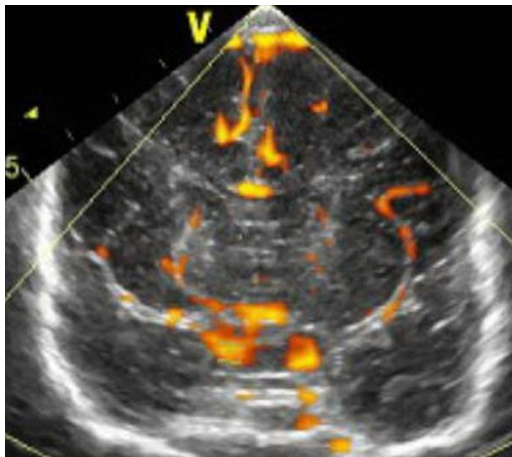
Alabama/ Neonatology Mobile, AL, USA

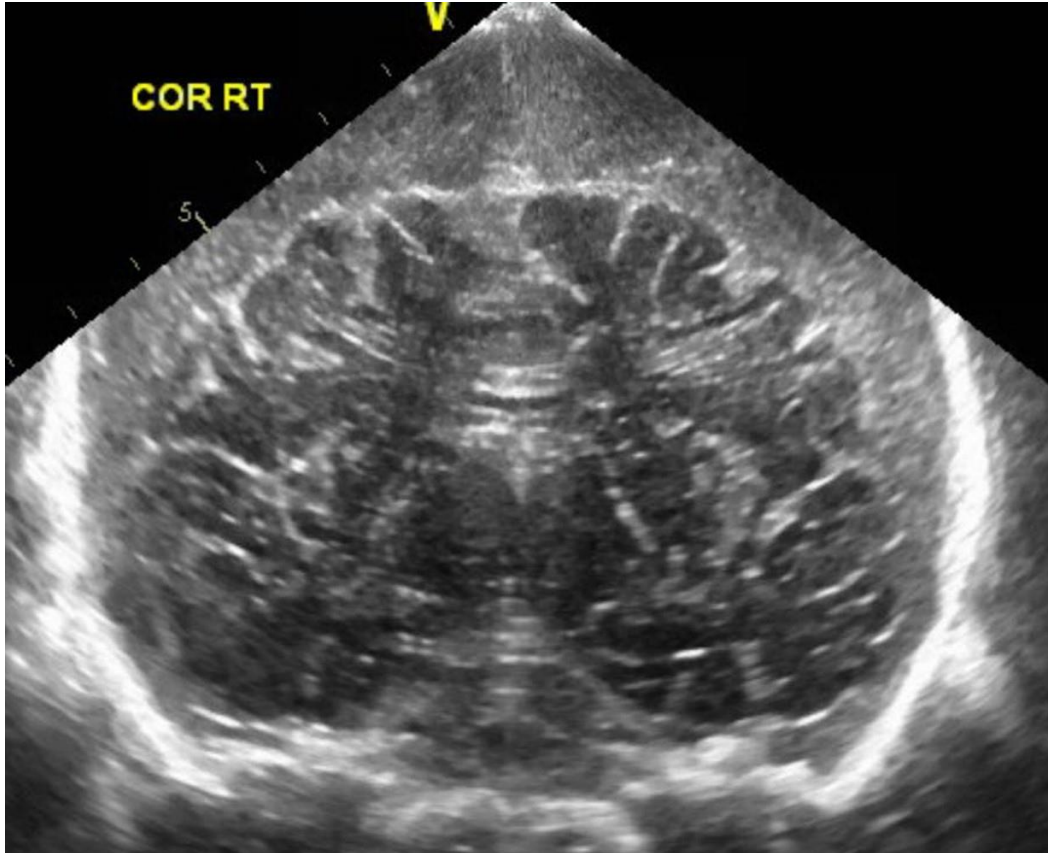
BACKGROUND & PURPOSE: Ninety-five percent of serious CNS injuries among infants less than 1 year of age are attributed to abusive head trauma. Multiple non-abusive causes of subdural have been reported. Lenticulo striatal vasculopathy (LSV) is currently not listed among the causes of non-abusive subdural hematoma.

METHODS: Case report

RESULTS: A 34 weeks gestation product of a pregnancy complicated by IDDM, preeclampsia, HELLP and PIH was delivered without complication. At 1 month of age diagnosis of LSV was established by neurosonography while evaluating the etiology of feeding difficulties and episodes of apnea and bradycardia (figure 1). At 5 months of age she presented after 2 weeks of increased irritability and vomiting. Head circumference was 41 cm. Sudden drop of hematocrit prompted repeated neurosonography. Bilateral acute and subacute subdural hematomas measuring 2.3 cm were highly echogenic (figure 2). The brain was small only displaying minimal growth while corpus callosum was normal in size.

CONCLUSIONS: Lenticulostriatal vasculopathy can lead to brain atrophy. Such infants are at increased risk for massive non-abusive subdural hematomas.





26. Characteristics of Ultrasound Laboratories that have Intersocietal Accreditation Commission (IAC) Transcranial Doppler (TCD) Accreditation in the United States

Mary B Farrell³, Endrit Ziu¹, Kevin D Cockroft¹, John Y Choi²

¹Penn State University Medical Center Hershey, PA, USA, ²Winchester Neurological Consultants, Inc Winchester, VA, USA, ³Intersocietal Accreditation Commission Ellicott City, MD, USA

BACKGROUND & PURPOSE: Little is known about characteristics of ultrasound laboratories performing TCD and in particular those accredited by the IAC. The aim of this study is to describe in detail the characteristics of IAC TCD accredited laboratories.

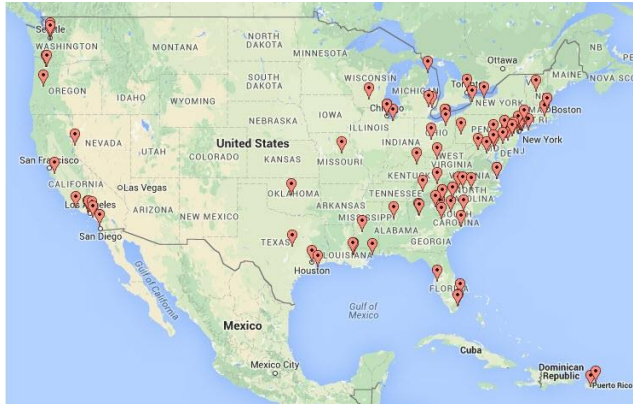
METHODS: This is a retrospective study evaluating site characteristics for all IAC laboratories with TCD accreditation. Descriptive statistics are included.

RESULTS: Evaluation of the site characteristics (Figure 1) for 97 laboratories

demonstrated a majority were hospital based (67% median 520 beds) with 35 (36.4%) classified as academic centers. Most were located in the south (43.3%) and the northeast (25.8%) (Figure 2). Only 35.1% of labs perform duplex imaging compared to 66.0% performing non-imaging TCD. A majority perform other ultrasound studies: extracranial=90.7%, venous=54.6% and arterial=55.7%. 66.0% were also accredited in echocardiography. The median annual volume of non-imaging studies was 240. Deficiencies result in delayed accreditation for most laboratories (84.5%). The average number of physicians per laboratory for all vascular ultrasound modalities was 1.99 ± 2.5 . Most physicians (n=186) were neurologists (59.1%) followed by vascular surgeons (21.0%). Established practice was the most frequent training/qualification pathway (54.8%), followed by formal training (21.0%) and vascular interpretation credential (19.4%). Finally, the most frequent method used to correlate the accuracy of TCD interpretation was CTA (32.7%), followed by angiography (30.8%) and MRA (25.1%). Overall correlation was 89.4%

CONCLUSIONS: Most IAC accredited TCD laboratories are hospital-based and the majority are also accredited in other ultrasound modalities. Accreditation appears to be rigorous as evidenced by the finding that the majority of applicant sites are not immediately accredited.

Characteristics of IAC TCD Accredited Facilities (n = 97)			
Accreditation Cycle (n (%))		Other IAC Accredited Modalities (n (%))	
First	7 (7.2%)	Echo	64 (66%)
Second	13 (13.4%)	Nuclear/PET	28 (28.9)
Third or more	77 (79.4%)	CT	8 (8.2%)
Annual Study Volume: (M ± SD)		MR	9 (9.3%)
(n (%))		Region (n (%))	
Intracranial studies	748.7 ± 725.9	Northeast	25 (25.8%)
Non-imaging	818.7 ± 741.1	Midwest	13 (13.4%)
64 (66.0%)		South	42 (43.3%)
Duplex studies	544.9 ± 677.3	West	17 (17.5%)
34 (35.1%)		Facility Type (n (%))	
Extracranial studies	1540.5 ± 1466.2	Non-hospital	32 (33.0%)
88 (90.7%)		Hospital-based	65 (67.0%)
Venous studies	4137.0 ± 4055.1	Hospital of Beds	605.3 ± 309.5
53 (54.6%)		Sites (M ± SD)	
Arterial studies	1240.4 ± 1097.1	1.99 ± 2.5	
54 (55.7%)		Physicians (M ± SD)	
Visceral studies	469.8 ± 495.0	6.8 ± 7.8	
38 (39.2%)		Sonographers (M ± SD)	
Intracranial Accreditation Decision (n (%))		7.0 ± 8.3	
Grant	15 (15.5%)		
Delay	82 (84.5%)		
Days to rectify deficiencies	101.8 ± 105.8		
Facilities never granted	13 (15.9%)		



27. Carotid Vessel Wall Volume Measurements by Three Dimensional Ultrasound Correlate with Magnetic Resonance Imaging Measurements

Hwaida Hannoush, Vandana Sachdev, Wen Li, Cynthia Brenneman, Katie Lewis, Steve Gonsalvez, Les G. Biesecker, David Bluemke, Jose Vargas
National Institutes of Health Bethesda, MD, USA

BACKGROUND & PURPOSE: Carotid intima–media thickness (CIMT) has been used as a marker of plaque progression on ultrasound (US) . However, its clinical utility has been limited by difficulties with reproducibility. Although carotid magnetic resonance imaging (MRI) provides an accurate assessment of carotid atherosclerosis by measuring vessel wall volume (VWV), it is time consuming and has contrast–associated risks. Three dimensional (3D) US is a novel and reproducible approach to carotid VWV measurement which , we hypothesize, will correlate with that measured by MRI.

METHODS: 21 asymptomatic participants (Males = 11, mean age 54+/-6 years) from the ClinSeq® study underwent carotid 3D US and MRI on the same day. ClinSeq® enrolled 1500 non–smokers (age 45–65 years), who are at risk for developing coronary atherosclerosis . Carotid MRI images were obtained by a Siemens 3T scanner . 3D US was performed with a iu22 ultrasound system (Philips) equipped with single sweep volumetric transducer vL 13–5. VWV was measured offline with software provided by Philips.

RESULTS: 40 carotid arteries were analyzed. 3 arteries had plaques causing less than 50% stenosis. There was a good correlation between 3D US and MRI VWV on the right side (Mean US VWV = 225.82± 27.06 ml, Mean MRI VWV = 236.31±

37.93ml R2= 0.638, P =0.002) and on the left side (Mean US VWV= 216.73± 32.29 ml, Mean MRI VWV= 226.10± 42.12ml R2= 0.572, p=0.008). Bland Altman analysis confirmed agreement between the two methods.

CONCLUSIONS: Measurement of carotid artery VWV using 3D US is feasible and correlates well with MRI in this pilot study. These findings suggest that 3D US is a promising tool for outcome and therapeutic follow up trials.

30. Transcranial Doppler Ultrasonography is a monitoring tool for Reversible Cerebral Vasoconstriction Syndrome

Jay H Levin¹, Jorge Benavides², Grayson Baird³, Janet Wilterdink^{1, 2}, Shadi Yaghi¹, Brian Silver^{1, 2}, Muhib Khan^{1, 2}

¹Department of Neurology, Alpert Medical School of Brown University Providence, RI, USA, ²Cerebrovascular Laboratory, Rhode Island Hospital Providence, RI, USA, ³Lifespan Biostatistics Core Providence, RI, USA

BACKGROUND & PURPOSE: Reversible cerebral vasoconstriction syndrome (RCVS) is vascular headache disorder characterized by severe headaches with vasospasm of cerebral arteries. Transcranial Doppler ultrasonography (TCD) has been widely applied and validated in studying vasospasm of intracranial vessels, but the role of TCD in the diagnosis of RCVS is not well established. We sought to determine the diagnostic yield of TCD in RCVS.

METHODS: Patients admitted to an inpatient neurology service between 2011 and 2014 with a discharge diagnosis of RCVS were retrospectively analyzed for demographics, neuroimaging, and functional outcomes.

RESULTS: Fifteen patients (14 female; average age 46.7 +/- 12.4 years) had initial TCD evaluation 10.9 +/- 6.6 (range, 1–24) days after headache onset. Eleven patients (73.3%) had increased flow velocities on initial TCD. RCVS patients with positive TCD had higher initial V_{mca} than those with negative TCD, 148.33 cm/s (CI 109.37–187.29) versus 76.25 cm/s (CI 54.79–97.7), $p=0.024$. Flow velocity in the MCA territory (V_{mca}), ACA territory (V_{aca}), and posterior circulation ($V_{posterior}$) reached peak flow velocities of 150, 120, and 90 cm/s, respectively, two to four weeks after the onset of thunderclap headache.

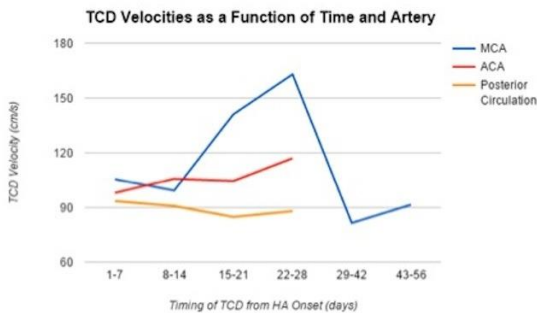
CONCLUSIONS: TCD is a non-invasive neuroimaging modality that may be

employed in emergency, inpatient, and outpatient longitudinal settings to evaluate patients with suspected RCVS.

Table. TCD results in patients with RCVS

Sonographic Characteristics	Entire RCVS Cohort (N=15)	RCVS+, TCD+ (N=11)	RCVS+, TCD- (N=4)	p
Timing of initial TCD, days +/- SD	10.9 +/- 6.6	11.6 +/- 5.0	8.8 +/- 10.6*	0.475*
Mean Initial V _{max} (cm/s)	n/a	148.33 (CI 109.37-187.29)	76.25 (CI 54.79-97.7)	0.024
Mean Max V _{max} (cm/s)	n/a	151.17 (CI 110.58-191.75)	85 (CI 55.6-114.36)	0.031

*If one patient outlier were excluded who had a negative TCD over three weeks after headache onset, the Timing of Initial TCD falls to 3.7 +/- 3.8; p=0.026.



31. Do Sonographic Lenticulate Striatal Vasculopathy and Retinopathy of the Premature Share common Pathogenic Mechanisms?

Paul Maertens, Maria Bramhall

University of South Alabama Mobile, AL, USA

BACKGROUND & PURPOSE: Lenticulate Striatal Vasculopathy (LSV) in infants has been associated with intrauterine infection, trisomy 13, maternal drug use, neonatal asphyxia, and neonatal bacterial meningitis. Retinopathy of the Premature (ROP) has been associated with Gestational age less than 31 weeks, exposure to Oxygen, low birth weight and various infections. Our goal is to investigate the possibility that LSV and ROP share common pathogenic mechanisms.

METHODS: Neurosonography was performed prospectively in all premature infants born in 2014 using Power Doppler imaging. Diagnosis of LSV was made when branching linear echogenic stripes obscured the Power Doppler signal of the insonated vessels. Patients requiring intravitreal injection of bevacizumab were considered to have significant ROP.

RESULTS: Out of 177 infants less than 31 weeks, 20 infants required intravitreal injection of bevacizumab to treat ROP. Six infants less than 31 weeks were diagnosed with LSV. Diagnosis of LSV was made at 1 month and 6 weeks of age in the 2 infants with gestational of 24 and 25 weeks respectively: these infants did not develop ROP. Diagnosis of LSV was made at 4 months of age in 4 infants with mean gestational age of 22 weeks (Between 21 and 23 weeks): these infants developed ROP

CONCLUSIONS: Our preliminary results suggest that severe prematurity is an additional risk factor for LSV. It is postulated that LSV and ROP share common pathogenic mechanisms.

32. Microembolus detection in cryptogenic stroke: Rationale and design of the MEDICS study

Anthony Noto, Manjunath Markandaya, Bogachan Sahin

University of Rochester, Strong Memorial Hospital, Department of Neurology
Rochester, NY, USA

BACKGROUND & PURPOSE: Cryptogenic stroke accounts for a substantial proportion of all ischemic strokes. The detection of cerebral microembolic signal (MES) by transcranial Doppler (TCD) has the potential to clarify stroke mechanism and predict recurrent stroke risk in this subpopulation. While a proximal embolic source or systemic process is often suspected in bilateral cryptogenic strokes, unilateral cryptogenic strokes affecting one major arterial territory may result from an occult ipsilateral large vessel thromboembolic source. Several imaging studies suggest such a mechanism, but no real-time physiologic evidence is currently available to further substantiate this possibility. The purpose of this study is two-fold: to determine 1) whether there is a difference in the pattern of MES (unilateral *vs.* bilateral) in single- *vs.* multi-territory cryptogenic strokes; and 2) whether single-territory cryptogenic strokes are more likely to be associated with ipsilateral MES, as opposed to no MES, or contralateral or bilateral MES.

METHODS: This is a single-center prospective cohort study with a planned enrollment of 40 consecutive patients presenting with an acute cryptogenic

stroke. Patients will be evaluated with 150 minutes of bilateral TCD monitoring before hospital discharge and followed for 6 months.

RESULTS: The primary endpoint will be unilateral or bilateral MES detection during the acute hospital admission. The secondary endpoint will be recurrent stroke or transient ischemic attack within 6 months.

CONCLUSIONS: MES detection by TCD has the potential to clarify stroke mechanism in patients with cryptogenic stroke. This may in turn help define new subsets of ischemic stroke patients for future clinical studies.

33. Transcranial Doppler Emboli monitoring artifact due to possible longer than suggested half-life of definity contrast used in echocardiogram

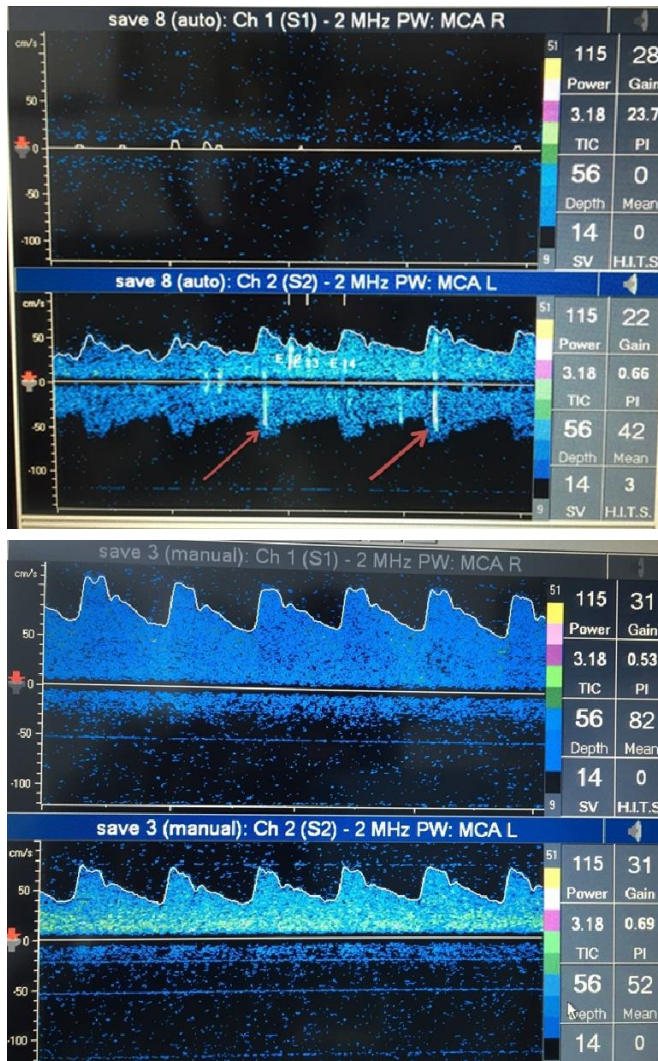
Ramnath-Santosh Ramanathan, Vela-Duarte Daniel, Natalie Organek, Lileth Joy Mondok, Leasa Baus, Maureen McGeary, Yelena Brooks, Ashley Beltran, Mei Lu
Cleveland Clinic/Neurology Cleveland, OH, USA

BACKGROUND & PURPOSE: Definity (perflutren lipid microsphere-composed of octafluoropropane (OFP) encapsulated in an outer lipid shell) is non-blood based ultrasound contrast agent approved by US FDA for use in patients with suboptimal echocardiograms to improve the delineation of the left ventricular endocardial border. OFP was not detectable after 10 minutes in most subjects in clinical trials either in the blood or in expired air and concentrations in blood declined in a mono-exponential fashion with a mean half-life of 1.3 minutes. Definity contrast might have a longer half-life than suggested and may interfere with transcranial doppler (TCD) emboli monitoring.

METHODS: Case Report

RESULTS: 38-year-old female with HTN and postpartum cardiomyopathy presented with acute right MCA infarct. She underwent transthoracic echocardiogram (TTE) and received definity contrast for left ventricular endocardial border detection. 2 hours after TTE, TCD (figure 1) emboli monitoring done initially on the left side showed 535 microembolic events in the left MCA while the right side done 20 minutes later showed 4 microembolic events in the right MCA while TCD bubble study did not show right to left

shunting. These TCD microemboli were felt to be artifactual due to possible contamination from definity contrast performed earlier. Repeat TCD (figure 2) emboli monitoring 4 hours after initial test did not show any microemboli. **CONCLUSIONS:** To our knowledge we report first case of definity contrast causing delayed TCD emboli monitoring artifact in absence of right to left shunting which may indicate a longer wash out time of the contrast than estimated.



34. An fNIRS Study of Phonotactic Elements Contributing to English and Spanish Word Identification

Alejandro Brice, Christina Salnaitis, Molly Quinn, Rachel Gormley, Jacqueline Barrett, Antwon Frazier, Zachary McNiece, Robert Gray, Ana Luna, Briana Attalla,

Carlos Barbour, Barbara Marques, Diana Rafailova, Rain Christi, Devin Plant, Ander Baranda

University of South Florida, St. Petersburg St. Petersburg, FL, USA

BACKGROUND & PURPOSE: The purpose of the present study was to identify the phonotactic elements that affect speed and activation level of word recognition for monolingual and bilingual speakers. It was expected that due to no lax vowels in Spanish the bilinguals would be slower and require more activation than monolinguals who are exposed to tense and lax vowels in English. It was expected that speakers would require time and more activation for voiceless consonants due to voicing features.

METHODS: Twenty-six monolingual and 10 bilingual speakers participated. Sentences were presented in either English or Spanish followed by target words in either English or Spanish in 70ms increments. After each presentation, participants indicated whether or not they knew the word and if they were 100% confident. Participants wore a 16-optode functional near infrared spectroscopy (fNIRS) device to measure oxygenation changes during the experiment.

RESULTS: Broca's area was more active in monolinguals than bilinguals across word type. Across the prefrontal cortex lax vowels produced higher activity than tense vowels for both monolinguals and bilinguals. The ventromedial prefrontal cortex showed more activity in bilingual speakers for lax vowels than monolingual speakers.

CONCLUSIONS: The results confirmed the hypotheses that lax vowels required more activation due to the lower energy expenditure in producing these sounds. The hypothesis for bilingual activation being greater on lax vowels was also supported, but was restricted to the ventromedial area. This area is generally involved in conflict monitoring and working memory as people regard different choices.

35. Prefrontal Activation During Word Identification for Bilinguals and Monolinguals: An fNIRS Study

Christina, L Salnaitis, Alejandro Brice, Molly Quinn, Rachel Barrett, Antwon Frazier, Zachary McNiece, Ana Luna, Briana Attalla, Carlos Barbour, Diana

Ravailova, Rain Christi, Devin Plant, Ander Baranda, Aaron Huba, Danica Tan, Alexis Diaz

University of South Florida, St. Petersburg St. Petersburg, FL, USA

BACKGROUND & PURPOSE: The purpose of this investigation was to explore whether bilinguals and monolinguals engage in different processing in the prefrontal cortex while recognizing English and Spanish words. Due to learning more than one language, it is expected that bilinguals will have greater flexibility in recognizing words.

METHODS: Twenty-six monolingual English-speakers and 10 bilingual English- and Spanish-speakers participated. Sentences were presented in either English or Spanish followed by target words in either English or Spanish in 70ms increments. After each presentation, participants indicated whether or not they knew the word and if they were 100% confident. Participants wore a 16-optode functional near infrared spectroscopy (fNIRS) device to measure oxygenation changes during the experiment.

RESULTS: Bilinguals were faster at recognizing the Spanish words than monolinguals and were equivalent at word recognition for English words. Ventromedial prefrontal cortex was more active in monolinguals as they identified Spanish words followed by English sentences. Right dorsolateral prefrontal cortex was more active in bilinguals speakers identifying English words followed by English sentences. Dorsomedial prefrontal areas were activated in bilinguals recognizing Spanish words followed by Spanish sentences.

CONCLUSIONS: The right side activation for Spanish speaking bilinguals is consistent with current hypotheses of bilateral language localization amongst these second language learners. For English monolingual speakers, the medial activation suggests the speaker is monitoring the sounds for error detection and expending additional working memory resources on unfamiliar sounds.

36. Metabolic changes in the brain of patients with HTLV-1-associated myelopathy/tropical spastic paraparesis

Manuel Schutze¹, Luiz C. F. Romanelli¹, Herika M. M. Vasconcelos¹, Carlos

Malamut², Debora M. Miranda¹, Marco A. Romano-Silva¹, Michael Brammer³
¹Universidade Federal de Minas Gerais Belo Horizonte, Brazil, ²Centro de Desenvolvimento da Tecnologia Nuclear Belo Horizonte, Brazil, ³Kings College London / Institute of Psychiatry London, United Kingdom

BACKGROUND & PURPOSE: Human T-lymphotropic virus type 1 (HTLV-1) infection is asymptomatic for the major part of seropositive patients, but approximately 0.25–3.8% present with HTLV-1-associated myelopathy/tropical spastic paraparesis (HAM/TSP). This clinical condition is characterized mostly by chronic progressive spastic paresis. Pathophysiology of HAM/TSP includes T-cell mediated inflammatory response and degeneration in the spinal cord and in the central nervous system. Little is known about the metabolic correlates of this process in the brain of subjects with HAM/TSP, particularly when compared to asymptomatic patients. In this study, we proposed to investigate metabolic changes in the brain of HTLV-1 seropositive patients with and without HAM/TSP.

METHODS: We acquired resting state 18F Fluorodeoxyglucose Positron Emission Tomography (18F FDG-PET) brain images of 28 consented patients seropositive for HTLV-1. Using the Expanded Disability Status Scale (EDSS), half of the patients were classified as asymptomatic carriers (EDSS=0) and the other half as HAM/TSP (EDSS>2). A machine learning approach based on Gaussian Process Classification (GPC) was used to classify patients according to their images. The accuracy of the method was assessed through leave-one-out cross-validation.

RESULTS: The algorithm was able to classify patients with 86% accuracy ($p < 0.001$), which suggests a discriminating pattern of metabolic activity between the groups (figure1). The weight map for GPC shows a diffuse and generalized hypermetabolism in the HAM/TSP group (figure2).

CONCLUSIONS: Our results suggest a generalized hypermetabolism in brains of the HAM/TSP group, which might be related to the inflammatory response. Further studies are necessary to investigate the cause of the hypermetabolism.

Gaussian Process Classification

