Washington University
School of Medicine
Department of Neurology

Neurology Academic Symposium

Friday, May 17, 2024
7:30am – 9:00am

Farrell Learning and Teaching Center ~ Atrium

Poster presentations will begin at 7:30am

Research awards will be presented at 8:45am

We encourage everyone to attend this important event.

Agac, Busranur

Paraneoplastic Mononeuropathy Multiplex in a Patient with Primary Ovarian Cancer and Papillary Thyroid Cancer

OBJECTIVE: To describe a patient with paraneoplastic mononeuropathy multiplex (MNM) associated with ovarian and papillary thyroid cancer.

BACKGROUND: MNM is typically associated with vasculitis. It rarely presents as a paraneoplastic disorder, commonly with neoplasms of the lung.

DESIGN/METHODS: NA

RESULTS: A 65-year-old woman with no significant past medical history presented with progressive subacute weakness, numbness, and pain in both arms for 2.5 months. Neurological examination showed bilateral arm weakness, decreased sensation, and diminished reflexes in multiple nerve distributions. No upper motor neuron signs were seen. Serum tests showed elevated ESR at 92, positive ANA at 1:2560, elevated neurofilament light chain (NfL) at 2011, and elevated CA 125 at 176.3. CSF studies were normal. Brain MRI showed corticospinal tract hyperintensity on DWI and FLAIR sequences. EMG/NCS showed findings consistent with MNM. Muscle and nerve biopsies were suggestive of a vascular or immune etiology. CT of the chest, abdomen, and pelvis was normal. PET scan showed increased uptake in the right ovary and omentum. Supraclavicular lymph node biopsy was suggestive of primary ovarian cancer and papillary thyroid cancer. Serum paraneoplastic panels were negative. The patient was treated with IVIG, IV methylprednisolone, and IV cyclophosphamide with minimal improvement of her symptoms. She then underwent chemotherapy with carboplatin and taxol, and tumor debulking surgery. At 3-month follow-up, she showed a slight improvement in her strength, and NfL and CA 125 levels were decreased.

CONCLUSIONS: MNM may present as a paraneoplastic disorder with ovarian and papillary thyroid cancer. Corticospinal tract hyperintensity may be seen in paraneoplastic disorders. CT screening alone may not detect the neoplasm. In suspected malignancy, PET scan should be performed.

Astani, Samra

Introduction:
There are many resources and video lectures created for medical education, however, there is not a source for core neurocritical care topics for learners entering the Neuro ICU or taking care of critically ill neurological patients in other ICU settings. We created four videos in collaboration with the Instructional Design Studio at WashU using their advanced lightboard method to keep learners engaged with the presenter but also able to focus on key points utilizing slides. Our target audience were medical learners about to enter in the Neuro ICU or work with critical neurological patients in other settings. These learners included registered nurses, advanced practice providers, residents (Emergency Medicine, Neurology, Neurosurgery, Internal Medicine, among others), and fellows (Critical Care fellows).

Methods:
We created four video lectures about core neurocritical care topics: Traumatic Brain Injury, Ischemic Stroke and Intracerebral Hemorrhage, Subarachnoid Hemorrhage, and Status Epilepticus. Two videos were played in a lecture series hosted at Barnes Jewish Hospital in which we had a target audience of 70 people. People then volunteered to take a pre-quiz prior to the videos followed by a post-quiz with the same questions.

Results:
We had 45 participants in our pre-quiz with a mixture of RNs and APPs and 43 participants in our post-quiz. Our quiz a had total of four questions with the average pre-quiz score being 33%. The post-quiz which included the same questions after the two videos had a score of 62%. 43/43 people would recommend the videos to their colleagues and generally had good verbal feedback.

Conclusions:
The Neurocritical Care Video Series showed a significant impact in learners' knowledge and kept leaners engaged in the material.

Castro-Apolo, Ramiro

YALE DYSPHAGIA SCREENING

QUALITY IMPROVEMENT PROJECT

Ramiro Castro-Apolo, MD; Melissa Schmidt, DNP; Megan Jaskowiak, SLP; Rajat Dhar, MD

INTRODUCTION:

The incidence of overt aspiration is 8–22%, and the incidence of silent aspiration is as high as 88% in intensive care unit (ICU) patients. [1, 2]

Prior to 2008, all patients referred for a swallow test were evaluated instrumentally, due to lack of an accurate and reliable clinical or bedside evaluation; leading to an enormous volume of new SLP consult nationwide. [3] With the increasing need of a more accurate assessment, the Yale Dysphagia Screening was developed; and it has shown a sensitivity of 96.5-100%, specificity 59-64% and NPV of 97.9-100% and FNR of <2%, determining the aspiration risk in critical care patients. [4, 5]

PURPOSE:

The clinical validity, reliability and usefulness of the Yale Dysphagia Screening has been largely confirmed in multiple previous studies; however, this has not been further applied to the neurologic population, particularly with diagnosis of stroke, with a very high incidence of aspiration in some case series. The purpose of this project is to implement the Yale Swallow Screening tool in the Neurocritical Care Unit (NNICU), aiming to expedite enteral feeding initiation in neurologic patients with particular interest in stroke care.

METHOD:

An observational study with prospective data collection and retrospective analysis, conducted in the NNICU at Barnes Jewish Hospital. Data was obtained through NNICU inpatient chart review and divided in 2 cohorts. First group integrated by the patients admitted from October to December 2023 who underwent traditional "BJC" bedside swallow evaluation <*Appendix A*> prior to enteral feeding; and the second group included those admitted from March to April 2024 who were evaluated through Yale dysphagia screening <*Appendix B*>. Group A only included patients who had a SLP evaluation regardless of bedside evaluation outcomes. Initiation of enteral feeding (oral or tube feeding) was calculated since arrival to NNICU. Aspiration was defined as any respiratory decline deemed to be secondary to swallowing failure and required intervention by the SLP or medical team. Statistical analysis was performed through GraphPad Prism 10 software. Fisher's exact test assessed categorical variables, and Mann-Whitney tested continuous variables.

RESULTS:

Fifty-six patients (27 females; median age 66 years) with acute neurologic diagnosis, who underwent swallowing evaluation following traditional BJC bedside dysphagia screening (Group A) were contrasted with sixty-seven subjects (29 females; median age 67 years) who were assessed with Yale screening protocol (Group B) prior to starting enteral feeding. Demographic characteristics in both groups were statistically similar <*Table 1*>; except by a higher frequency of nasogastric tube use in Group A population (46.4% vs 20.9%, *p 0.003*). Group A included 83.92% of stroke patients (47/56) and Group B

68.65% (46/67). SLP consultation was ordered in 38.8% of the patients in Group B, 56.52% [26/46] corresponding to the stroke population, considerably lower percentage in comparison to the historic large consultation volume, mainly driven by the inability to perform a nursing bedside evaluation in patients with facial weakness. No difference in enteral feeding initiation was reported (Mean time 1.2 days in group A vs 0.9 days in group B, *p 0.0519*); which could be explained by the large SLP demand in Group A. Instrumental utilization by SLP was not statistically different in both groups (Group A 30.29% vs Group B 61.54%, *p 0.09*). Complication for aspiration was similarly low in both group (7.14% vs 4.48%, *p 0.7*).

CONCLUSIONS:

The data obtained in this study appears to further support its utilization as a tool to identify patients on risk for aspiration applied specifically to the neurologic intensive care population, with a decrease of an unnecessary use of SLP resources. Even though, instrumental evaluation was not significantly different in both groups, there was trend towards increased use in Group B, showing the accuracy of Yale Screening Protocol as a tool to identify patients that will require more specialized dysphagia testing.

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APPENDIX A

BARNES-JEWISH Hospital

Washington University in St. Louis

ATTACHMENT A
Acute Stroke Dysphagia Screen

ACUTE STROKE DYSPHAGIA SCREEN

To be completed on all patients upon admission with diagnosis of stroke. If any of the following questions are answered with a yes, stop and refer to speech pathology.

	YES	NO
1) Is the Glascow Coma Scale LESS than 13?	☐	☐
2) Is there Facial Asymmetry/Weakness?	☐	☐
3) Is there Tongue Asymmetry/Weakness?	☐	☐
4) Is there Palatal Asymmetry/Weakness?	☐	☐
5) Are there signs of aspiration during the 3 oz water test?	☐	☐

- If all findings for the first 4 questions are **NO**, proceed to the 3 oz water test.
- Administer 3 oz of water for sequential drinks, note any throat clearing, cough or change in vocal quality immediately after and 1 minute following the swallow. If clearing, coughing or change in vocal quality is noted, refer to speech therapy.
- If all of the answers to the above questions are **NO**, then start the patient on a regular diet.

APPENDIX B

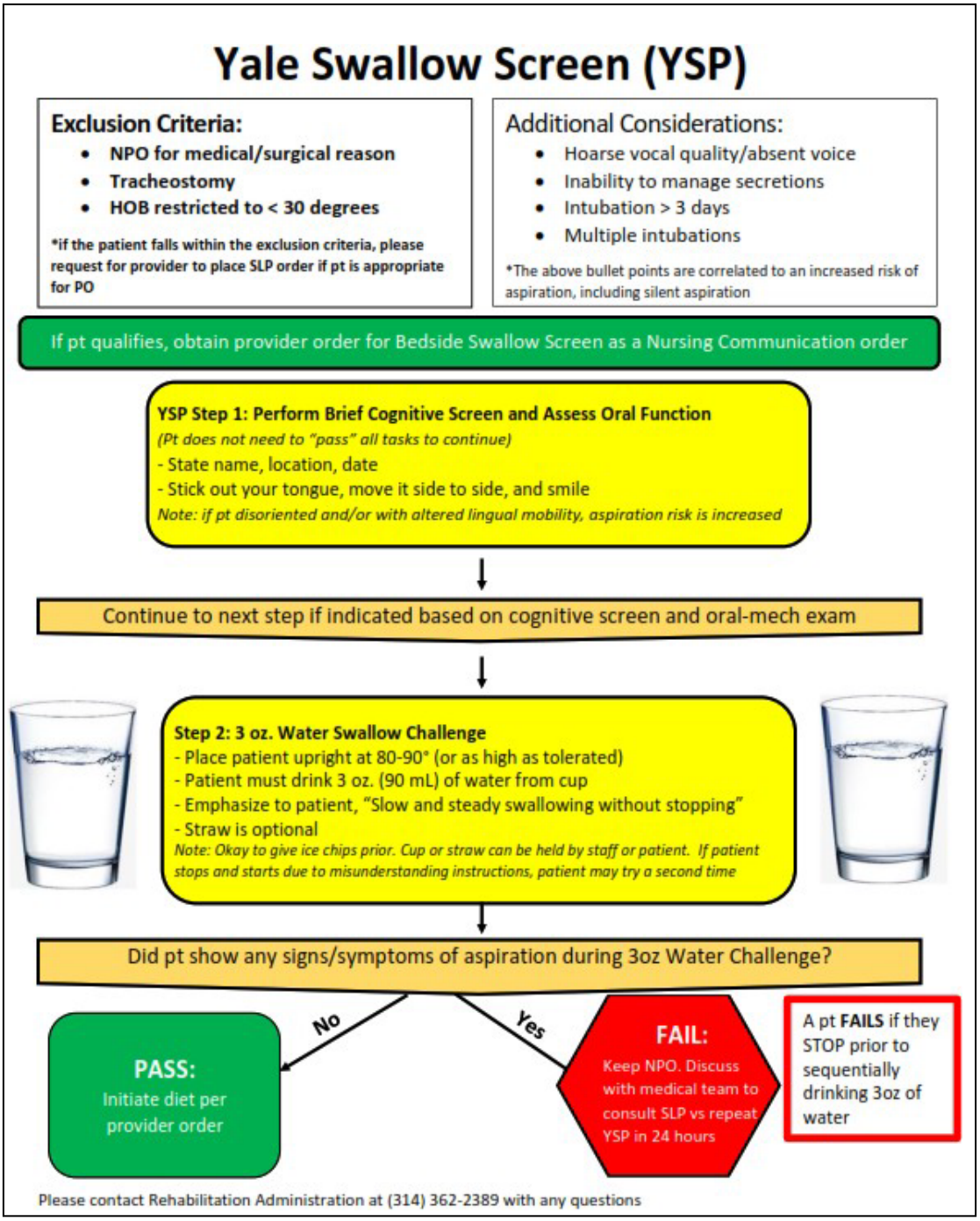
Yale Swallow Screen (YSP)
Exclusion Criteria:
NPO for medical/surgical reason
Tracheostomy
HOB restricted to < 30 degrees
*if the patient falls within the exclusion criteria, please request for provider to place SLP order if pt is appropriate for PO
Additional Considerations:
Hoarse vocal quality/absent voice
Inability to manage secretions
Intubation > 3 days
Multiple intubations
*The above bullet points are correlated to an increased risk of aspiration, including silent aspiration
If pt qualifies, obtain provider order for Bedside Swallow Screen as a Nursing Communication order
YSP Step 1: Perform Brief Cognitive Screen and Assess Oral Function
(Pt does not need to "pass" all tasks to continue)
- State name, location, date
- Stick out your tongue, move it side to side, and smile
Note: if pt disoriented and/or with altered lingual mobility, aspiration risk is increased
Continue to next step if indicated based on cognitive screen and oral-mech exam
Step 2: 3 oz. Water Swallow Challenge
- Place patient upright at 80-90° (or as high as tolerated)
- Patient must drink 3 oz. (90 mL) of water from cup
- Emphasize to patient, "Slow and steady swallowing without stopping"
- Straw is optional
Note: Okay to give ice chips prior. Cup or straw can be held by staff or patient. If patient stops and starts due to misunderstanding instructions, patient may try a second time
Did pt show any signs/symptoms of aspiration during 3oz Water Challenge?
No
Yes
PASS:
Initiate diet per provider order
FAIL:
Keep NPO. Discuss with medical team to consult SLP vs repeat YSP in 24 hours
A pt FAILS if they STOP prior to sequentially drinking 3oz of water
Please contact Rehabilitation Administration at (314) 362-2389 with any questions

TABLE 1. Demographic Characteristics

Characteristic	Group A	Group B	p-value
Gender (Female *n* [%])	27 (48.21)	29 (43.28)	0.59
Age (median)	66	67	0.24
Diagnosis (*n*)			
• Ischemic Stroke	26	20	
• Hemorrhagic Stroke	21	26	
• Neuromuscular	1	0	
• Craniotomy	2	8	
• Other	6	13	
Intubation (*n* [%])	20 (35.71)	17 (25.37)	0.55
Intubation time (median)	1	1	0.13
NGT in place (*n* [%])	26 (46.4)	14 (20.9%)	**0.003**
NGT time (median)	6	2.5	0.66

Bashardost, Leeda

Cerebral venous sinus thrombosis: A rare manifestation of primary CNS vasculitis

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Primary Angiitis of the central nervous system (PACNS) was first recognized in 1959 and continues to be a rare condition[1]. Initially thought to be a grim diagnosis but with increased awareness, early treatment may improve prognosis[1]. However, due to a diverse and non-specific clinical manifestation of this disease, diagnosis is frequently delayed. Headache, ischemic infarcts and encephalopathy commonly serve as the initial presentation[3,7-8]. PACNS is characterized by a prolonged prodromal period, marked by symptoms that may not be restricted to one vascular territory [14].

We report a case of a biopsy-proven PACNS, that manifested with central venous sinus thrombosis. A 42-year-old male patient with childhood hearing loss, recent new-onset seizures and mild leptomeningeal enhancement on brain MRI presented with altered mental status and seizures. His head CT showed bilateral temporal lobe intraparenchymal hemorrhage (IPH) associated with vasogenic edema and leftward subfalcine herniation requiring a ventriculostomy. The clinical course was complicated with refractory elevated intracranial hypertension and progressive vasogenic edema that eventually required decompression hemicraniectomy. Biopsy results confirmed granulomatous vasculitis. Despite initiation of steroid therapy, the patient's prognosis remained poor, ultimately did not survive due to extensive intracranial insult.

PACNS remains a challenging diagnosis due to its wide range of symptoms and a lack of non-invasive diagnostic test with good specificity. Currently, histopathological confirmation with brain biopsy [14] remains the gold standard for diagnosis. However, awareness of reported clinical symptoms along with the combination of ancillary tests can aid in early identification of cases. The clinical manifestation presented in this case report underscores a distinct feature of PACNS, enhancing awareness of its diverse manifestation and potentially leading to improved management in similar cases.

Bashardost, Leeda

Treatment Challenges in Refractory Status Epilepticus: A descriptive analysis comparing Initial Anesthetic Utilization and a prognostic score (STESS) with outcome measures.

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Objective:
Refractory status epilepticus (RSE) is a life-threatening neurological condition characterized by persistent seizures despite having two adequately dosed antiepileptic agents. RSE poses significant challenges in management and is associated with high morbidity and mortality.
Anesthetic agents, typically midazolam, propofol and ketamine are employed as third-line treatments for RSE. The agents aim to achieve either target (seizure suppression or burst suppression) on electroencephalography (EEG) for a period of 24-48h before careful weaning. However, the lack of strong evidence makes it challenging to favor one agent over another, given the scarcity of comparative data. This analysis explores the utilization pattern of these agents in relation to their targets and assesses their impact on efficacy and outcomes. Moreover, various prognostic scores have been devised for status epilepticus patients with STESS (Status epilepticus severity score) emerging as a tool to assess in-hospital mortality in status epilepticus patients. To predict outcome for RSE, STESS calculation were performed.

Methods:
In this descriptive study, 44 patients diagnosed with RSE were identified from the medical database. The study aimed to compare the first anesthetic choice and STESS with several outcome measures:
a) Discharge status at 6 months (classified as dead or alive).
b) Time taken to achieve the target (seizure suppression or burst suppression).
c) Achievement of the target with just one IV anesthetic.

Results:
The analysis included 33 patients, that met the inclusion criteria. The median STESS was 3, with a mean of 3.88 ± 1.5 for the “dead group” and 2.65 ± 1.22 for the “alive group”. Results indicated a medium effect size in the disparity of STESS between dead and alive groups, suggesting a likelihood of having higher values of STESS in the “dead” group ($p = 0.02$). Predominantly, propofol (16) and versed/midazolam (13) were the most utilized anesthetics. Twelve patients achieved seizure suppression using single IV anesthetic. Among the propofol group 5 out of 16 achieved seizure suppression with a mean time of 10.2 hrs, while in the versed group, 7 out of 13 achieved it with a mean time of 9.3hrs. Interestingly, additional IV anesthetics were administered despite achieving seizure suppression in the propofol group. Seizure suppression was maintained for 24 hrs before weaning. A medium size effect is observed in the difference in time to seizure suppression between midazolam and propofol, suggesting a lower value for time to seizure suppression in the midazolam group ($|r| = 0.3$) although this was not statistically significant ($p = 0.3$).

Conclusion:
STESS can serve as a predictive factor in assessing outcomes for patients with refractory status epilepticus (RSE). Among this group, the primary anesthetic choices were typically propofol or midazolam. While midazolam was associated with a shorter time to seizure suppression, this correlation did not reach statistical significance. Notably, the propofol group tended to receive additional anesthetics even after achieving seizure suppression, potentially indicating a lapse in continuous EEG monitoring. Implementing continuous EEG monitoring in RSE cases could potentially mitigate the need for initiating additional anesthetics and optimize patient management.

Chopra, Ravi

Exploring corticospinal network failure in a mouse model of amyotrophic lateral sclerosis (ALS)

Abstract:

Neurodegenerative diseases are dynamic pathologies that reflect failure at multiple scales (molecular, cellular, network, and organ). The recognition of non-linear interactions (such as “tipping points” [1]) has led to a growing call for dynamical systems frameworks that leverage multi-dimensional datasets for causal inference [2]. This approach provides a unique opportunity to model and intervene on the fundamental object of clinical interest: progressive neurologic symptoms associated with pathology in affected circuits.

In ALS, there is growing evidence that macro-scale measures of corticospinal network performance track with symptoms in human patients [3-5], but micro-scale measures of network structure or excitability in animal models have been divergent without a unifying mechanism [6, 7]. These differences across scales are likely to be biologically meaningful, as they are a feature of healthy corticospinal networks and require a multi-scale analysis to be understood [8]. To date, there is no longitudinal multi-scale dataset for capturing network performance in an ALS mouse model.

Here we describe a method for capturing cellular, network, and behavioral measures of corticospinal network failure through a self-contained behavioral and neural data capture platform that will be applied in the B6.CgTg(SOD1*G93A)Gur/J (hSOD1-G93A) mouse model of ALS. Our method pairs two complementary techniques for capturing corticospinal network dynamics, namely 1) automated home-cage behavior analysis during motor performance [9], and 2) chronic multi-electrode array recordings in primary motor cortex (M1). The dataset generated using this method will allow for reconstruction of multi-scale network measures, namely a network biomarker termed *criticality* [10] and task-relevant neural dynamics using *neural manifolds* [11]. We will benchmark these measures against current best practices in ALS model research [12]. We anticipate that multi-scale analysis of corticospinal network failure will outperform existing unimodal biomarkers and will serve as a foundation for development of dynamic biomarkers or multi-level therapeutic strategies.

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Crayle, Jesse

Improving Resident Physician Perceptions and Usage of Atraumatic LP Needles

Jesse Crayle MD[1], Lauren Langford MSN[1], Gabriela De Bruin MD[1]
[1]Department of Neurology, Washington University in St Louis

Background and Objectives:

Lumbar punctures or spinal taps are frequently performed procedures that are considered generally safe but may be complicated by a post-dural puncture headache (PDPH) with an incidence up to 15%. One way of decreasing the risk of PDPH is the usage of an "atraumatic" needle. Multiple consensus guidelines recommend using an atraumatic needle based on level 1 evidence that using atraumatic needles significantly reduce the incidence of PDPH (RR 0.40, 95% CI 0.35-0.47) with a similar decrease in risk of needing a therapeutic epidural blood patch and no increase in other procedural complications. Choosing atraumatic needles has not become universal in the neurology community. The primary aim of this QI project was to increase neurology resident physician usage of atraumatic needles at a single institution. Secondary objectives included increasing resident physician knowledge and perceptions about atraumatic needles.

Methods

This was an unblinded single arm interventional quality improvement project with pre- and post-intervention data collection. All adult neurology resident physicians (PGY-2 to PGY-4) at a single institution completed pre-intervention and post-intervention surveys on LP needle preference and perceptions. In addition, data regarding LP procedures was abstracted from the EHR from July 1, 2023 to October 31, 2023 (pre-intervention) and December 1, 2023 to March 31, 2024 (post-intervention). The intervention consisted of a one-hour educational seminar discussing the history of LP, the importance of using atraumatic needles and practical advice for success with LP. Also, in the post-intervention period, 5-inch atraumatic needles were made available on the neurology ward in addition to the 3.5-inch atraumatic needles that have been available (5-inch needles were previously only available intermittently and not on the neurology ward).

Conclusions

Late-breaking data assessing the effectiveness of this QI intervention on improving resident usage of atraumatic LP needles will be presented.

DeKorver, Nicholas

Variable clinical and epilepsy phenotypes within a family harboring a novel deletion in NPRL3

ABSTRACT: Genetic variants in sub complexes of GTPase activating protein complex that inhibits RAG-dependent activation of TORC1 (GATOR1) including DEPDC5, NPRL2 and NPRL3 are associated with epilepsy and brain malformations with variable clinical phenotypes. Here, we describe the varying phenotypes within three family members carrying a novel deletion [arr[GRCh37] 16.p13.3(148142_148300)] involving exon 9 in the NPRL3 gene. Our index patient is a young male with seizures starting shortly after birth that evolved to drug-resistant multifocal epilepsy and epileptic spasms. His MRI demonstrated multifocal pachygyria of right temporal, occipital, and inferior parietal lobes. FDG-PET while on ketogenic diet revealed marked hypermetabolic activity in similar areas with concomitant EEG showing on-going seizures. Patient's seizures were refractory to medications, ketogenic diet, and temporal-occipital posterior motor disconnection, but improved following hemispherectomy. Pathology of resected temporal operculum demonstrated cortical dysplasia. Our patient's mother had focal cortical dysplasia and medically refractory epilepsy treated with surgical resection. Patient's maternal grandfather has pharmacoresponsive epilepsy. This case provides clinical data on the phenotypic variability of NPRL3 related epilepsy within families. A "two-hit" hypothesis has been proposed as a possible explanation for this variability. Further genetic testing of our patient's family may be able to provide further support for this hypothesis. Understanding factors modifying clinical phenotypes can improve patient care and identify new therapeutic targets.

Eid, Abdulmunaim M.

Regional Brain Volume Differences Across PD Clinical Subtypes

Abdulmunaim M. Eid, Sarah Grossen, Aaron Tanenbaum, John Hood, Helen Hwang, Therese V. Cash, Hristina N. Lessov-Schlaggar, Paul T. Kotzbauer, Joel S. Perlmutter, Meghan C. Campbell

Objective
To investigate brain morphometric differences across Parkinson disease (PD) clinical subtypes.

Background
We developed a PD subtype classification with three subtypes that includes motor and non-motor features based on multi-domain classification [1, 2]. Here, we examined volumetric differences across these three distinct PD clinical subtypes, 'motor only,' 'psychiatric & motor' and 'cognitive & motor.' We hypothesized that these PD subtypes differ in their regional cortical thickness and subcortical volumes.

Methods
Participants completed T1 (MPRAGE) structural MRIs OFF PD medications on a 3T MRI scanner. We used FreeSurfer v7.3 automated atlas-registration and volume segmentation software to obtain cortical thickness and subcortical volumes, with quality control checks and manual edits as necessary. Analyses of covariance (ANCOVA) compared regional cortical thickness and subcortical volumes (corrected for total intracranial volume) across subtypes, with age, sex, education, and time since motor onset as covariates. Significant group differences were followed with post-hoc pairwise comparisons using multiple comparison correction with Benjamini-Hochberg adjusted $p < 0.05$.

Results
The 'cognitive & motor' subtype (N=62) showed significantly decreased cortical thickness compared to each of 'motor only' (N=116) and 'psychiatric & motor' (N=27) subtypes in left parahippocampal ($p = 0.025$ & 0.016), left fusiform ($p = 0.027$ & 0.037), and left lingual ($p = 0.02$ & 0.011) regions, and compared to 'motor only' subtype in right entorhinal ($p = 0.043$), right inferior parietal ($p = 0.03$), and right lateral occipital ($p = 0.024$) regions.

Conclusions
The 'cognitive & motor' PD subtype had decreased cortical thickness in temporoparietooccipital regions compared to the other two subtypes, suggesting this subtype exhibits a unique pattern of posterior cortical volume loss. Longitudinal analyses may reveal additional differences in brain atrophy across PD subtypes.

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Everett, William

Neurofilament Light Chain Species in SMA Patients Treated with Nusinersen

Spinal muscular atrophy (SMA) is an autosomal recessive genetic disorder that leads to loss of lower motor neurons. The underlying genetic pathology is usually due to biallelic deletion of exon 7/8 of the survival of motor neuron 1 (*SMN1)* though point mutations in *SMN1* are occasionally found. Clinically, SMA manifests with progressive lower motor neuron symptoms including weakness, atrophy, and fasciculations. In severe cases, bulbar and respiratory muscles are eventually affected leading to tube feeding and ventilator dependence. SMA has a wide range of ages of symptom onset from birth to adulthood with these varying ages of onset classified from SMA type 0 to type 4. Typically, earlier disease onset is associated with a more severe course. The wide variance in SMA disease onset and progression is mediated by the number of copies of the survival of motor neuron 2 *(SMN2)* gene with lower copy numbers associated with earlier-onset and more severe disease. *SMN2* is a duplication of *SMN1* that differs in a single nucleotide that results in alternative splicing of the *SMN2* pre-mRNA excluding exon 7. When translated, this truncated SMN protein is rapidly degraded. However about 10% of the time, exon 7 in the *SMN2* mRNA is retained resulting in functional full-length SMN protein. Thus, the more copies of *SMN2* that are present, the more function SMN protein will be produced. There are currently 3 FDA approved treatments for SMA. Nusinersen, the first FDA-approved treatment, is an intrathecally administered antisense oligonucleotide (ASO) that acts by binding to *SMN2* pre-mRNA and sterically hindering the splicing that excludes exon 7 and leading to more SMN protein. In clinical trials, patients with SMA treated with nusinersen achieved new motor milestones and had lower risk of ventilator dependence. As the disease course and thus potential treatment response in SMA2/3 is slower than SMA1, various biomarkers have been evaluated to monitor for and predict treatment response. Neurofilaments are structural axonal proteins that have been studied and found to be elevated in neurodegenerative and other neurological disease possibly due to “leak” from damaged axons. The single-molecule array allows for measurement of low levels of NfL in blood. However, this technique is unable to measure distinct NfL species that may be present in different diseases states. A recent study showed that sequential immunoprecipitation followed by mass spectrometry could identify different populations of NfL fragments in the brains and CSF of patients with Alzheimer’s disease. In this study, we used immunoprecipitation and mass spectrometry to measure the concentrations of various NfL species in the CSF of SMA patients being treated with nusinersen at baseline and during early treatment.

Faridi, Warda

A Case Series of Antibody Drug Conjugate associated Immune Neuropathies

Objective:

Background:
Antibody Drug Conjugates (ADCs) are rapidly emerging as promising targeted therapies for treating cancer. There have been limited studies reporting the associated neurological side effects. Our goal is to present a case series of two patients presenting with ADC associated suspected immune neuropathy.

Design/Methods:
N/A

Results:

Case 1:
63 year-old man presented with subacute-chronic progressive weakness, sensory loss, and areflexia between January and March of 2024 following treatment of metastatic tonsillar squamous cell carcinoma with novel ADC, ozurifitamab vedotin (September 2023-January 2024). Electrodiagnostics were consistent with an acquired, mixed demyelinating-axonal polyradiculoneuropathy. Labs were notable for elevated ESR, ANA 1:320, and NfL of 246. Sural nerve biopsy showed large endoneurial microvessels, loss of large > small axons, some large axons with no associated myelin, thin myelin sheaths, and non-diagnostic immune stains. He received acute treatment with plasmapharesis and IV methylprednisoloine during his admission in March 2024.

Case 2:
69 year-old male presented with progressive symmetric sensory loss, paresthesias, imbalance, sensory ataxia, and proximal and distal weakness with areflexia since November 2023. This was temporally associated with receiving 10 cycles of trial drug ARX517 between November 2023 and March 2023. Electrodiagnostics were consistent with a subacute mixed axonal-demyelinating polyradiculoneuropathy meeting CIDP criteria. Lumbar puncture showed protein of 55 with 5-10 nucleated cells. Acute, demyelinating, and paraneoplastic antibody panels were negative. Serum NfL was normal at 26. MRI Spine showed ventral nerve root enhancement in the lumbar spine. He received induction treatment for CIDP with IVIg 2 g/kg during recent admission in March 2024 with clinical improvement.

Conclusions:
Neurological toxicities associated with ADCs have not been thoroughly explored in existing literature. Here, we present two cases of CIDP linked to ADC treatment, each with distinct presentations and involving different ADC compounds. These cases underscore the necessity for evaluating for immune neuropathies in patients initiating ADC therapies and emphasize the importance of close post-treatment monitoring.

Gregersen, Maren

Examining the Impact of the Chief Day Off on Resident Wellness, Patient Care, and Team Efficiency

Our program has been working to improve our balance between the demands of a clinical career in medicine with maintaining personal health and wellness. Over the last couple of years, the schedules of our residents have undergone changes aimed at improving resident wellness without negatively impacting patient care. This study assesses the impact of a Chief Day Off on resident wellness, patient care, and team efficiency. The goal of these surveys is to provide insight into the effects of the Chief Day Off to further guide inpatient team structure while maintaining or improving resident's sense of wellness. To make these assessments, surveys were sent to current and former residents from the classes of 2020-2026 and faculty who attended on service this past academic year when the chief day off was implemented. Surveys were sent to 82 individuals, and 29 responded (35% response rate). Due to the low response rate, statistical analyses were unable to be performed.

Overall, there is broad support for the chief day off from residents, faculty, and alumni. Some neurology faculty reported the need to adjust their workflow to accommodate the chief day off, but the majority did not feel significantly impacted by it. Overall, the chief day off did not impact patient care except some rare reports that it impacted goals of care conversations. There was a trend toward improved sleep and quality of life for chiefs although most did not report spending the day off on wellness related activities. This study was limited by the low response rate of residents, alumni, and faculty. Some questions were phrased differently for residents versus faculty, which makes the comparison between faculty and resident responses imprecise. Future, ongoing surveys will continue to probe the impact of the chief day off and ways to further improve the experience for the entire team. Workflows and team guidelines can be developed to minimize any perceived effect on patient care.

Khasawneh, Mohammad

Safety of Mechanical Thrombectomy for Large Vessel Occlusion Stroke in Pregnancy

Mohammad Khasawneh MD, Fatih Koc MD, Isobel MacKenzie MD, Brendan Eby MD.

Background and Objectives: Stroke during pregnancy is a significant medical event with the potential for devastating outcomes on maternal mortality and disability and potential risks to the developing fetus. Mechanical thrombectomy (MT) has emerged as a highly efficacious treatment for ischemic stroke with large vessel occlusion (LVO) in non-pregnant patients. However, data regarding the safety and efficacy of MT in pregnant women with LVO remain limited, as they were systematically excluded from most pivotal clinical trials. This systematic review aims to evaluate the safety of mechanical thrombectomy in large LVO strokes in pregnancy.

Methods: A comprehensive literature search across PubMed, EMBASE, Web of Science, and Cochrane Library identified studies on MT in pregnant women with confirmed LVO stroke. Studies reporting procedural outcomes, maternal/fetal complications, and mortality were included.

Results: Twenty-eight patients (mean age 31.4 years) were identified across 24 studies. Stratified by trimester, MT was performed in 11 patients during the first trimester, 9 patients in the second trimester, and 8 patients in the third trimester. The imaging modality used for diagnosis was CTA in 23 patients and MRA in 5 patients. Techniques used for MT included stent retriever thrombectomy, stent retriever-assisted continuous aspiration, direct contact aspiration, and multimodal combined techniques. Successful reperfusion (TICI 2B or above) was achieved in 25 patients (89.3%). No immediate maternal complications or symptomatic hemorrhages were reported. One case of petechial hemorrhagic transformation (HI-1) was observed. One unrelated and one elective abortion occurred, with 23 patients achieving full-term deliveries. All patients with reported post-discharge follow-up had good functional outcomes (MRS 0-2).

Conclusions: This review suggests MT may be a safe and effective reperfusion strategy for LVO stroke in pregnancy. The high rate of successful reperfusion and minimal complications observed are encouraging. However, the limited sample size and the heterogeneity of the included studies necessitate further investigation with larger, prospective studies to definitively confirm the safety and efficacy of MT across all trimesters of pregnancy.

Kiguradze, Tina

Causes Of Death In Individuals with Neurofibromatosis type 1 (NF1): A Single-Center Experience

Tina Kiguradze, Ethan Hillis, David H. Gutmann, Aditi Gupta

Introduction:

Neurofibromatosis 1 (NF1) is an autosomal dominant cancer predisposition syndrome caused by germline mutations in the *NF1* tumor suppressor gene[1]. As such, individuals with NF1 are at high risk of developing malignant neoplasms, the most common of which is the malignant peripheral nerve sheath tumor (MPNST). Previous studies have suggested that NF1 is associated with a decreased life expectancy. For example, a US-based analysis of death certificates reported a mean age at death for persons with NF1 at 54.4 years compared with 70.1 years in the general population, with estimated prevalence of malignant neoplasms at 34 times that of the general population[2]. Furthermore, another study noted a bimodal trend in NF1-associated mortality using death certificates, with peaks between adolescence and 40 years of age, and then again after the age of 50[3]. Similarly, a French study found a bimodal distribution of ages of death in adults with NF1[4]. These studies, among many others, highlight the vulnerability of young adults with NF1 to develop life-shortening malignant neoplasms and emphasize the importance of close medical follow up. In this study, we report one institution's experience in caring for children and adults with NF1, focusing on the causes of death in those who died between 2012 and 2024.

Methods

We conducted a retrospective analysis of all NF1 subjects seen at the Washington University School of Medicine NF1 Clinic who died between 2012-2024. Data were pulled from the EPIC electronic health records and manually reviewed. Pertinent extracted data included demographics, co-morbidities, cause of death, age at death, presence of neoplasm, and age at diagnosis of neoplasm. Statistical analyses were performed using GraphPad Prism. The study design and methods were approved by the institutional IRB (#201706112).

Results

We identified 48 NF1 subjects who met the inclusion criteria. Seventy three percent of individuals had a neoplasm, where 51% had a MPNST. The mean age of death in the whole NF1 cohort was 48 years (St. Dev. = 18.9), while in those with MPNST, it was 38 years (St. Dev. = 13.8). There was a bimodal distribution, with peaks in the 31-40 and 61-70 age groups. There was no difference in age of death among NF1 individuals when stratified by race. However, compared with the demographics of the whole NF1 cohort, a greater than expected number of subjects in the "No Neoplasm" group identified as Black or African American (7/14 subjects, $p=0.04$, chi-squared analysis).

Discussion

Our single center experience identified a bimodal distribution in age of death among NF1 subjects. Most NF1 subjects have a malignant neoplasm at the time of death, with the most frequent neoplasm being MPNST. The mean age of death in our cohort was similar to what has been previously reported in the literature. Importantly, we have identified that the mean age of death in individuals with NF1 and MPNST is significantly lower than that of those harboring other neoplasms. This finding highlights the importance of close follow up of young adults for the development of MPNST with the aim of providing early intervention. In the entire NF1 cohort, the age of death was not different among races. However, we identified that subjects identified as Black or African American were disproportionately represented in the "No neoplasm" group. One possibility is that neoplasms are underdiagnosed in this population. Our study stresses the vulnerability of young adults with NF1 to develop life-shortening malignant cancers, and the importance of close follow up with their medical team during the transition to adult care.

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Klinman, Eva

Age-associated changes in organelle behavior and cytoskeleton structure in micro-RNA reprogrammed human neurons

Abstract:
Age is the primary risk factor in the development of dementia and many other neurodegenerative conditions. However, modeling changes associated with age in human neurons is challenging. Neurons derived from induced pluripotent stem cells are stripped of their age-associated epigenetic signatures, and animal models cannot capture the complexity of the human proteome. The Yoo lab has pioneered a method to permit the study of aging in human neurons using microRNA to directly convert human skin fibroblasts into neurons (microRNA-induced neurons or miNs). These miNs retain the age-specific epigenetic and cellular properties of the donor fibroblast, enabling evaluation of healthy aging in neurons in vitro.

In this project we compare miNs from healthy young and old donors, focusing on the behavior of critical organelles and their reliance on the neuronal cytoskeleton. We identify age-related changes in the distribution of lysosomes, and relate this to decreased acidification of autophagosomes in neurites derived from older donors. We additionally characterize changes in mitochondrial dynamics, with advanced age favoring enhanced dynamic interactions between mitochondria. We observed that the distribution of the microtubule binding protein tau, which is involved in tauopathies such as Alzheimer's disease, changes with advancing age. Reducing tau expression in miNs from old donors reversed the phenotype of increased mitochondrial dynamics to levels observed in young donors.

Ongoing work seeks to determine what aspect of these changes may predispose individuals to sporadic Alzheimer's disease or other forms of age-related neurodegeneration.

Lee, Michelle

A case of tenecteplase for pediatric acute ischemic stroke

Michelle M. Lee, Nicholas W. DeKorver, Grace M. Tabatabai, Tanner Hoke, Kimberly Mills, Tammara King, Theresa Timm, Amelia Bray-Aschenbrenner, Ananth Vellimana, Maria M. Galardi, Kristin P. Guilliams

OBJECTIVE

We report the use of tenecteplase in a case of pediatric acute ischemic stroke (AIS), as prior reports have been limited to adult stroke.

METHODS

A 13-year-old female with depression presented with acute onset left-sided weakness. Her initial NIHSS was 13 – scored for drowsiness requiring stimulation to maintain wakefulness, right gaze preference, left facial droop, dysarthria, left upper and lower extremity weakness, and left-sided neglect. Presentation was concerning for right middle cerebral artery (MCA) territory stroke. Hyperacute MRI demonstrated diffusion restriction with ADC correlate and lack of FLAIR hyperintensity within right MCA territory involving lentiform nucleus and frontal and insular cortices (core volume estimated 9 mL). Non-contrast MRA identified a large vessel occlusion within the proximal M1 segment of the right MCA. She received tenecteplase (0.25 mg/kg) three hours from symptom onset prior to undergoing successful endovascular mechanical thrombectomy. Post-intervention head CT at 12 and 36 hours did not have any intracranial hemorrhage. Patient participated in inpatient neuro-rehabilitation with improvement in functional outcomes. Her NIHSS at time of discharge was 6 with a modified Ranken score of 3.

RESULTS

Intravenous thrombolysis with tenecteplase was safely provided as a rapid single bolus to a pediatric patient with AIS prior to thrombectomy. She had no evidence of hemorrhagic conversion on follow-up imaging and improvement in function.

CONCLUSIONS

This case demonstrates the safe use of tenecteplase prior to thrombectomy in the treatment of pediatric AIS. Prospective studies are needed to determine the safety and efficacy of tenecteplase in pediatric stroke.

Li, Alan

Delayed Diagnosis of Carotid Cavernous Fistula in Patients with Ocular Symptoms: A Case Series and Literature Review

Introduction: Carotid-Cavernous Fistulas (CCF) can be diagnostically challenging due to their diverse clinical presentations. Due to its anatomical location and the critical structures housed within the cavernous sinus, patients often present with nonspecific ocular symptoms. These presenting symptoms can mimic other ophthalmic and infectious conditions, leading to initial misdiagnosis. Highlighting this diagnostic complexity, we present a case series of three patients who initially presented with ocular symptoms, ultimately leading to the diagnosis of CCF.

Materials and methods: We conducted a retrospective chart review of our institution's database between December 2022 and February 2024 to identify patients who initially presented with ocular symptoms such as unilateral ocular pain, proptosis, or vision loss. These patients received an initial diagnosis other than CCF but were ultimately diagnosed with CCF.

Results: Three patients were identified:

Case 1: A 72-year-old woman with worsening vision initially attributed to local spread of dental infection; showed no improvement with antibiotics. DSA revealed a ruptured right cavernous ICA aneurysm (16.7x15.2x14.8mm) with direct right CCF (bilateral jugular bulb/internal jugular vein drainage). Steal syndrome caused by the fistula led to minimal right cerebral hemisphere perfusion. [Image 1: lateral view of L-ICA angiography]

Case 2: A 71-year-old woman with periorbital pain and swelling after a dental abscess. Despite initial treatment with antibiotics for presumed orbital cellulitis, she developed proptosis and vision loss. Imaging revealed left cavernous sinus thrombosis and a CCF (Barrow D, bilateral meningeal/external carotid feeders, right superior ophthalmic vein drainage). [Image2]

Case 3: A 61-year-old woman with right eye swelling and blurry vision received treatment for a presumed infectious etiology based on MSSA bacteremia (ophthalmic vein thrombosis/cavernous sinus thrombosis/cellulitis). Follow-up imaging suggested right CCF. DSA confirmed a ruptured, partially thrombosed right cavernous ICA mycotic aneurysm (likely CCF source).

Conclusion: The presented case series underscores the diverse clinical manifestations and diagnostic challenges associated with CCFs. Prompt recognition and accurate diagnosis are paramount, given the potential for irreversible vision loss and neurological complications if left untreated. Clinical suspicion should remain high, particularly in patients presenting with unilateral eye pain, swelling, and elevated intraocular pressure, as timely intervention can mitigate adverse outcomes. While cerebral angiography remains the gold standard for diagnosis, non-invasive imaging modalities such as CT or MR angiography can serve as valuable initial screening tools.

Lindley, Gabrielle

Heterozygous HTRA1 Deletion in a Patient Presenting with CADASIL Phenotype: An HTRA1-CSVD Case Report

Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL) is an inherited vasculopathy affecting small penetrating arteries, arterioles, and brain capillaries that is classically caused by cysteine-altering pathogenic variants in the NOTCH3 gene. CARASIL is a similar small vessel vasculopathy, though inherited in an autosomal recessive pattern, and is distinct in its association with alopecia and lumbago. CARASIL is classically caused by homozygous missense mutations in the HTRA1 gene. Despite these clinical distinctions, there is emerging evidence to suggest that certain pathogenic variants in the HTRA1 gene, particularly heterozygous mutations resulting in loss of function, can lead to atypical CARASIL phenotypes that appear to be more consistent with a milder form of CADASIL. We present one such case of a patient with classical CADASIL symptoms with later age at onset and lesser burden of white matter disease at time of diagnosis who was found to have a heterozygous HTRA1 c.671 deletion of unknown inheritance pattern.

Meadows, Christine

Electrodiagnostic characteristics of multisystem proteinopathy due to *VCP/p97* mutations

Christine A. Meadows, MD, Conrad C. Weihl, MD, PhD, Mohammad Al-Lozi, MD
Washington University in St. Louis, Department of Neurology Neuromuscular Section.

Objective: To characterize the electrodiagnostic findings in 15 patients with multisystem proteinopathy (MSP) due to autosomal dominant *VCP/p97* mutations.

Introduction: Mutations in the gene encoding valosin-containing protein (*VCP/p97*) cause an adult-onset, autosomal dominant multisystem proteinopathy[1]. This results in a diverse spectrum of neurodegenerative phenotypes including inclusion body myositis (IBM), amyotrophic lateral sclerosis (ALS), frontotemporal dementia (FTD), and Paget disease of bone[2]. Muscle biopsy demonstrates rimmed vacuoles with ubiquitin-positive and tubulofilamentous inclusions[1]. Due to muscle weakness, many patients receive an electrodiagnostic study as part of their workup. However, the electrodiagnostic characteristics of *VCP*-related MSP have not yet been defined.

Methods: Charts from patients seen in the Washington University neuromuscular department between 2009 and 2024 with confirmed *VCP* mutations were retrospectively reviewed. Patients with electrodiagnostic studies were included in our review. Data from nerve conduction and needle electrodiagnostic (EMG) studies were collected.

Results: The charts of 15 patients were included in the study. All patients had a confirmed mutation in the *VCP* gene and were symptomatic at the time of EMG. The mean age was 53 years. Three patients had motor units that were exclusively myopathic, three patients had motor units that were exclusively neuropathic, and the remaining nine patients had mixed neuropathic and myopathic motor units. The muscles most likely to demonstrate myopathic motor units were the trapezius, rhomboids, infraspinatus, biceps brachii, deltoid, flexor carpi radialis, and flexor digitorum profundus. The muscles most likely to demonstrate neuropathic motor units were the thoracic paraspinals, gluteus maximus and medius, vastus medialis, tibialis anterior, medial gastrocnemius.

Conclusion: The majority of the patients demonstrated a mixed neuropathic and myopathic pattern on needle EMG, with upper extremity muscles being more likely to be myopathic and lower extremity muscles being more likely to be neuropathic. Our findings further characterize electrodiagnostic findings seen in MSP caused by *VCP* mutations.

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Rau, Naraharisetty

RFC1 Biallelic Pathogenic Expansions in ALS: A Posthumous Analysis

Abstract:

Biallelic (AAGGG)n pentanucleotide repeat expansions in the replication factor C subunit 1 (RFC1) gene is cause of late-onset hereditary ataxias and CANVAS (cerebellar ataxia, neuropathy, vestibular areflexia) [1].

RFC1 expansions are associated with a multisystemic neurodegenerative disease with diverse clinical manifestations including cerebellar ataxia, peripheral neuropathy, and vestibulopathy [2-7].

Two ALS patients undergoing postmortem exam at the WashU were found to have biallelic RFC1 expansions.

A role for pathogenic RFC1 expansions in increasing risk of ALS or motor neuronopathy remains unclear.

Okendo, Joyce

Outcomes in Patients with Spontaneous Intracerebral Hemorrhage

Abstract

Introduction/Objective: Nontraumatic, spontaneous intracerebral hemorrhage accounts for 10-15% of strokes annually in the United States and carries a higher morbidity and mortality risk compared to ischemic stroke. With approximately 70% of patients developing motor dysfunction, spontaneous intracerebral hemorrhage remains a clinically devastating condition. This study aims to relate functional outcomes, in terms of hospital length of stay and hospital disposition with radiographic variables including intracerebral hemorrhage location (deep versus lobar), volume and laterality (right versus left).

Materials and Methods: Approximately 380 patients were identified from the Washington University IQARIS database from July 2018-March 2022. A descriptive analysis of the selected cohort was conducted. Patients with supratentorial intracerebral hemorrhage from hypertensive, cerebral amyloid angiopathy or anticoagulation etiologies were included. Mean age, gender, ICH score and volume metrics were included for each subject. Patients with infratentorial locations or secondary causes for intracerebral hemorrhage such as vascular malformation, aneurysm, venous sinus thrombosis and tumor were excluded.

Results: Results demonstrated 225/380 and 115/380 patients with deep versus lobar hemorrhage location. Average hospital length of stay was approximately 11 days and on average patients were discharged to nursing homes. Further statistical analysis will be conducted to determine if correlation exists between location, volume, and laterality and functional outcomes.

Conclusion: Future research is warranted to determine if certain radiographic features can serve as predictors of poor functional outcomes in patients with spontaneous intracerebral hemorrhage.

Pehlivan, Esra

Differentiating pathology of ADEM from MS in children using diffusion MR biomarkers

Abstract

Objective: To investigate the pathological differences in patients with pediatric onset multiple sclerosis (POMS) and acute disseminated encephalomyelitis (ADEM) using diffusion tensor imaging (DTI) and diffusion basis spectrum imaging (DBSI).

Methods: 15 children with POMS and 8 children with ADEM underwent DTI and DBSI imaging. The comparison of DTI and DBSI diffusivity measures of POMS (31 scans) and ADEM (17 scans) was performed as group comparison and association over time.

Results: In univariate analysis of average measures of DBSI and DTI over time, lower DBSI factional anisotropy (DBSI-FA), higher DBSI fiber fraction (DBSI-FF) ($p=0.046$), higher DBSI radial diffusivity (DBSI-RD) ($p=0.016$) but lower DBSI non-restricted fraction (DBSI-NF) ($p=0.005$) in POMS patients compared to ADEM patients. These results suggest that both groups had demyelination and axonal injury, but POMS patient had higher degree of demyelination, lower degree of axonal integrity, higher axonal density and lower extra-axonal edema compared to ADEM patients. However, there are no significant differences in DTI measures between POMS and ADEM over time.

Conclusion: DBSI may be useful to monitor and quantitatively compare coexisting axonal injury, demyelination, and inflammation in central nervous system (CNS) white matter tracts in children with POMS and ADEM, overcoming the disadvantages of DTI. Larger prospective longitudinal studies are required to confirm these results.

Rankine, Kristina

Ictal Asystole in Refractory Epilepsy: A Case Report

Kristina Rankine, MD and B. Keith Day, MD PhD

Abstract:
Ictal asystole (IA) is defined as a sinus arrest triggered by an epileptic seizure and is a rare event observed in ~0.4% of patients undergoing long-term in-hospital video-EEG monitoring.1 Ictal asystole has been shown to be a cause of significant morbidity in patients and considerations for management have included implantation of cardiac pacemakers which has yielded mixed results in improvement of recurrent syncope and falls associated with IA.2 In this report we describe a patient with medically refractory temporal lobe epilepsy associated with recurrent syncope and drop attacks who was found to have ictal asystole and bradycardia in association with seizure propagation to the right insular region that is improved after epilepsy surgery.

Rodrigo, Shashika

Characteristics and predictors associated with 30-day hospital readmissions and 1-year mortality to adult neurology services in a large academic hospital

Shashika Rodrigo, MD[1], Lauren Langford, MSN, RN , Danilo Pena, MS, Osvaldo Laurido-Soto, MD

Objective

To examine characteristics and predictors of 30-day hospital readmissions and 1-year mortality for adult patients admitted to neurology services and their outcomes.

Background

Thirty-day hospital readmission rates are associated with increased morbidity and mortality. In 2012, the Center for Medicaid and Medicare (CMS) developed the Hospital Readmission Reduction Program to reduce preventable readmissions. Although readmission risk scores exist, other sociodemographic factors have not been examined as predictors and may be useful in guiding interventions to reduce readmissions. Using similar techniques in the readmission analysis, 1-year morality was also investigated.

Design/Methods

We performed a retrospective review of all patients admitted to our inpatient neurology services at a large academic hospital from 2021 to 2022. Readmitted patients included those returning to any hospital within our electronic medical record. We collected information on age, sex, race, disposition plan, health insurance, Charlson Comorbidity Index (CCI) and mortality. We performed Chi-square and Fisher's Exact tests to analyze the relationship between patient variables and readmission risk. Multi-variable logistic regression was conducted to identify significant predictors in readmission and mortality classification.

Results

We examined 3,915 admissions to our neurology services. After applying exclusion criteria, 2,687 patients were included. Patients who were black, aged 70-79, insured by Medicaid/Medicare, with CCI ≥ 4, discharged to SNF, rehab or home health and with increased length of stay had significantly higher risk of readmission compared to chosen reference patients. Patients who were readmitted after index admission to stroke service were mostly readmitted due to medical reasons versus those readmitted to general were often readmitted due to neurological reasons. Patients who were readmitted also had significantly higher risk of mortality at 1 year ($p<0.001$) with a OR of 4.88 (3.41-6.98).

Conclusions

We identified several sociodemographic variables which confer additional risk of readmission across neurology services. We showed that there is a strong relationship between risk factors associated with readmission and mortality. Future work is needed to investigate how to best support patients with higher readmission risk.

Samara, Amjad

Increased periventricular thalamic damage gradient in multiple sclerosis detected by quantitative gradient echo MRI

Abstract:
Objective: Thalamic tissue damage in multiple sclerosis (MS) follows a 'surface-in' gradient from the ventricular surface. The mechanisms leading to this gradient are not completely understood. Using quantitative gradient-recalled echo (qGRE) MRI, we evaluated a periventricular thalamic gradient of tissue integrity in MS and its relationship with clinical variables.

Methods: Structural and qGRE MRI scans were acquired for a cohort of MS patients and healthy controls (HC). qGRE-derived R2t values were used as a measure of tissue integrity. Thalamic segmentations were divided into 1-mm concentric bands radiating from the ventricular surface. Median R2t* values within these bands were used to calculate the periventricular thalamic gradient.*

Results: We included 44 MS patients and 17 HC. R2t increased slightly in HCs from the ventricular surface. MS patients had a steeper periventricular thalamic gradient compared to HC (mean slope 0.69 vs. 0.52; $p < 0.003$), which correlated with longer disease duration ($\beta = 0.01$ /year; $p = 0.001$) and higher Expanded Disability Status Scale (EDSS) score ($\beta = 0.08$ /EDSS point; $p = 0.002$). Left and right thalamus were symmetrically affected.*

Conclusions: We detected an increased thalamic gradient in MS in vivo using qGRE MRI, which correlates with disease duration and higher clinical disability. These findings further support the 'surface-in' pathology hypothesis in MS and suggest a CSF-mediated process given symmetric bithalamic involvement.

Shelton, Georgia

Teaching Neuroanatomy to Residents: Proof of Concept for a New Didactic Format

Abstract:

For the 2023-2024 academic year, a new didactic was introduced to fill a gap in the neurology residency curriculum. Wednesday Morning Neuroanatomy has been a weekly, 45-minute, multimodal didactic format aimed at exposing residents to high-yield neuroanatomical topics and improving resident confidence with neuroanatomy and its clinical application. Over the course of this one-year effort, this new model has been well-received, and engagement has been high. While this year serves more as a proof of concept, it provides a basis for expanding the model and studying the educational efficacy.

Tabatabai, Grace

Decreasing Time to Anti-Seizure Medication Administration: A QI Initiative

Grace M. Tabatabai MD; Saumel Ahmadi MD, PhD; Mirelle Bird NP, MBA

OBJECTIVE: Ongoing seizure activity poses a risk to the developing brain and requires urgent administration of ASMs for prevention of further seizure activity. We recognize a hospital wide opportunity to shorten the window to anti-seizure medication (ASM) administration within St. Louis Children's Hospital. Several factors may play a role in the delay to ASM administration including lines of communication, education of status epilepticus management amongst providers, and ease of access to abortive agents. For ease of data gathering and project implementation, our project focuses on infants in the NICU - a single unit within SLCH with continuous video EEG monitoring capabilities.

METHODS: Continuous EEG data recordings for those in the NICU were queried from 9/30/2021 to 3/1/2022. Studies were reviewed and the following time points identified: 1) time at which on-call neurology was notified of ongoing seizure activity on EEG 2) time at which ASM was delivered. An anonymous nursing survey was then administered to NICU nurses to assess seizure management education. Based on survey results, knowledge gaps were identified, and education was provided with the goal of filling those gaps.

RESULTS:

Time to ASM administration results: Of the total 106 NICU specific EEG patient studies reviewed, only 12 studies met criteria for capture of status epilepticus and ASM administration while on continuous video EEG. Data for these 12 infants revealed a range of 3 minutes to 41 minutes, with an average of 24 minutes, from the time of neurology notification of seizure activity on EEG to the time of ASM administration. Night shift vs day shift factor analysis was completed without a significant change in this average (23 min for night shift, 24 min for day shift.)

NICU Nursing Seizure Education results: 57 NICU nurses participated in our anonymous survey to query seizure management education. 93% of respondents identified status epilepticus (SE) as a medical emergency with 7% reporting being unsure if SE is a medical emergency. 79% reported an ASM should be given within 5 min of seizure onset with 19% reporting this should be given within 15 min of seizure onset and 2% reporting this should be given within 30 min of seizure onset. Only 13% correctly identified the definition of status epilepticus as sustained seizure activity lasting 5 minutes or longer.

CONCLUSIONS: Our findings reflect a need for ongoing improvement in timely ASM administration for those in status epilepticus in the NICU. Our survey findings suggest education regarding status epilepticus may be a high yield target to improve time to ASM administration metrics. High rates of nursing turnover may explain some of these knowledge deficits and may require routine education sessions monthly to keep up with turnover rates.

Vazquez-Velez, Gabriel E.

A case of spontaneous CSF leak in a patient with Marfan's syndrome

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Word count: 374

A 21 year old woman with a history of Marfan's syndrome presented to the hospital with positional headaches. The patient first developed occipital headaches that worsened with standing three months prior to presentation. She was treated for a suspected CSF leak with a blind lumbar blood patch, with only partial relief of symptoms at discharge. Approximately 6 weeks later, she developed a new headache and was found to have a right sided subdural hemorrhage and was treated with burr holes for decompression. She presented again 4 weeks later with recurrence of her positional headaches.

Brain MRI showed diffuse homogenous pachymeningeal enhancement and thickening on T1 weighted images enhanced with gadolinium contrast. Total spine MRI was then obtained which showed prominent fluid collections in the lumbosacral region. These findings were congruent with an unresolved CSF leak. A CT myelogram was then performed which showed contrast extravasation in posterior epidural space at S1, suggesting this was the site of the leak. The patient had a partial response to supportive measures, and she was ultimately treated with an image guided blood patch at L3-S1 because the extent of her soft tissue defects made more invasive approaches unfeasible. She was discharged home with significant pain relief.

This patient met ICHD-3 criteria for a headache secondary to spontaneous intracranial hypotension as she had evidence of a CSF leak by imaging which correlated with her symptoms. She also had a classic postural headache that worsened on standing and Marfan's syndrome is a known predisposing factor for CSF leaks. Notably, although low opening pressure on lumbar puncture can also be diagnostic, not all patients have abnormal opening pressures, and there is a risk of worsening of the leak. This case highlights several imaging features of intracranial hypotension due to a spontaneous CSF leak. First, it shows that CSF leaks can be associated with diffuse homogeneous pachymeningeal enhancement and thickening. Second, it demonstrates that patients with connective tissue disorders are at risk for complex leaks, and they should have myelograms to directly visualize the leak, determine its extent and help decide on the most appropriate therapeutic strategy. This is critical as it helps avoid subdural hemorrhages, such as the one this patient had, which are the most common complication of this condition.

Wang, Hannah

Central Sleep Apnea due to Opiate Medication in a Patient with Hypoglossal Nerve Stimulator

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Introduction: Since the result from the Stimulation Therapy for Apnea Reduction (STAR) trial was published in 2014 [1], hypoglossal nerve stimulation (HGNS) has been an increasingly favorable alternative treatment for obstructive sleep apnea (OSA) in patients who are unable to tolerate Positive Airway Pressure (PAP) treatment. However, patients with central sleep apnea (CSA) should not undergo HGNS implantation, as the mechanism of airway obstruction in CSA is different from the issue targeted in HGNS therapy. Here, we describe a patient who underwent HGNS implantation for his sleep apnea but was later found to have significant CSA on their post-implantation polysomnogram (PSG).

Report of Case: The patient is a 63 y/o M with chronic pain with chronic opiate use, who was originally diagnosed with OSA based on a PSG showing severe OSA with AHI 37 and RLS. He then had a repeat home sleep apnea test (HSAT) 2 years later which showed respiratory disturbance index (RDI) of 20.4. He has tried both CPAP and a dental appliance for his sleep apnea but was unable to achieve satisfactory results with neither treatment. He was referred for HGNS evaluation and underwent implantation shortly after. His post-implantation PSG revealed significant underlying CSA with ataxic and cluster breathing and showed that HGNS was not an effective treatment for his sleep apnea (3% overall AHI of 38 events per hour, with 3% central AHI of 37.1 events per hour). After this PSG, patient returned for an in-lab titration for adaptive servo-ventilation (ASV), and was able to achieve 3% AHI of 0.0 at expiratory positive airway pressure (EPAP) 5-15 cm H2O.

Discussion: Central apnea due to drug is commonly seen and opiates are most commonly implicated. HGNS, though effective for OSA, does not treat CSA. In this patient, his last sleep study before undergoing evaluation for HGNS was notably a HSAT, which is unable to distinguish between central and obstructive respiratory events. The fact that he had undetected significant underling CSA has led to failure in treatment with HGNS. Inadequate HGNS evaluation can lead to erroneous implantation with ineffective results. In the future, can consider having all patients undergo PSG before being considered for HGNS, though this proposition may have many real-life limiting factors.

Conclusion: While HGNS is emerging as a promising alternative to PAP therapy for the treatment of OSA, patients must undergo appropriate evaluation before undergoing the implantation procedure. Providers should be aware of the consequences that can result from inappropriate referrals to HGNS and should refer with caution.

[1] Strollo Jr, P. J., Soose, R. J., Maurer, J. T., De Vries, N., Cornelius, J., Froymovich, O., ... & Strohl, K. P. (2014). Upper-airway stimulation for obstructive sleep apnea. *New England Journal of Medicine*, *370*(2), 139-149.

Zerafati-Jahromi, Gazelle

Focal Cortical Dysplasia Represents a Unique MRI Finding in Two Patients with idic15 and Refractory Epilepsy

Gazelle Zerafati, MD; Oleg Lobanov, MD PhD; Judith Weisenberg, MD

Rationale

Isodicentric chromosome 15 or inverted duplication of proximal chromosome 15 (idic15), with an incidence of about 1 in 30,000, is the most common genetic disorder attributable to supernumerary marker chromosomes. The resultant clinical syndrome is well described in the literature; patients with this condition present with epilepsy, hypotonia, developmental delay and autistic features. Refractory epilepsy is a hallmark of idic15, occurring in about 75% of patients. Abnormal brain imaging findings have not been well characterized in association with this syndrome and focal cortical dysplasia specifically has never been reported. The frequency and nature of brain malformations in patients with idic15 should be further investigated, as the presence of anatomical cortical anomalies can have important implications in determining the subsequent management of epilepsy in this patient population.

Methods

This case report depicts two patients diagnosed with idic15, who presented with the typical sequelae of this syndrome, and specifically reviews their brain MRIs.

Results

The patients presented here, one girl and one boy, were both diagnosed with medically refractory epilepsy, autism, and global developmental delay. CMA of the female patient revealed quadruplication in the region of 15q11.2-q13.3. She was diagnosed with epilepsy at 9 years old, and today requires four anti-seizure medications to achieve seizure control. EEG demonstrated frequent sharp waves in the left frontoparietal region. Brain MRI (figure 1) showed abnormal cortical folding involving the left central sulcus, superior frontal sulcus and middle frontal gyrus, spatially corresponding well with the focal abnormalities on EEG. Visualization of these findings required 3D multiplanar reconstruction to correctly align and compare the original images. CMA of the male patient revealed variable degrees of amplification between 15q13.3 and the pericentromere. He was diagnosed with epilepsy at 2 years old and continues to have daily seizures despite receiving four anti-seizure medications. Brain MRI (figure 2) showed T2/FLAIR hyperintensity involving the cortical and subcortical tissue along a left midline frontal lobe gyrus. Surface EEG data was not clearly localizing, as it demonstrated both multifocal and generalized epileptiform abnormalities.

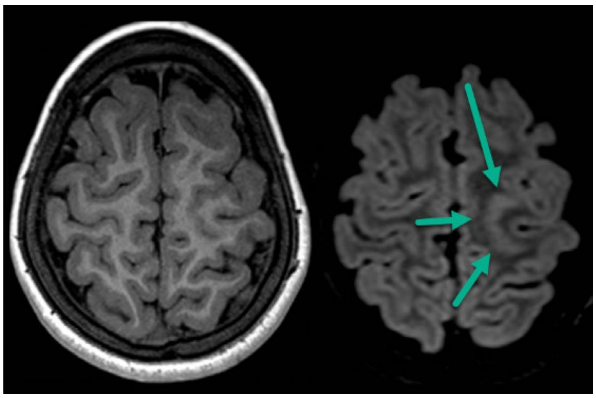

Figure 1: 3D multiplanar reconstruction of T1 (left) and FLAIR (right) MRI sequences demonstrate left-sided focal cortical folding abnormality (arrows).

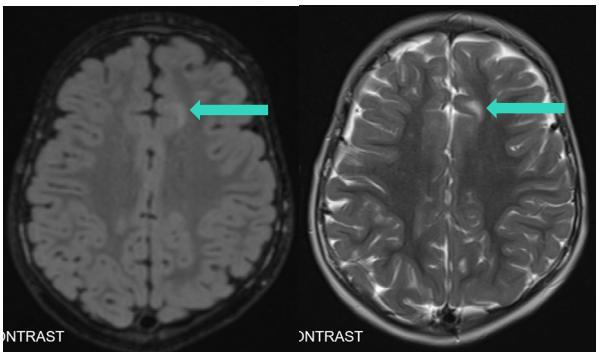

Figure 2: T2 (left) and FLAIR (right) MRI sequences demonstrate left focal cortical dysplasia.

Conclusions

We present two patients with idic15 and focal cortical dysplasia, an association not previously described in the literature, which may suggest a contributing structural etiology of their epilepsy and thus offer a potential surgical target. Further characterization of imaging findings in idic15 is needed.

Zhao, Wei

Severe facioglossal weakness and dysarthria due to bilateral perisylvian polymicrogyria

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We report a 20-year-old man with a history of hemiparetic cerebral palsy, microcephaly, intellectual disability, and childhood-onset focal epilepsy presented to our Epilepsy Transition Program to establish care. Seizure semiology included staring spells and convulsions, which were well controlled on monotherapy with oxcarbazepine. Examination showed significant lower facial and tongue weakness leading to severe dysarthria and excessive drooling. MRI showed bilateral perisylvian polymicrogyria (BPP). BPP is the most common form of polymicrogyria; its clinical manifestations include facio-pharyngeo-glosso-masticatory paresis, intellectual disability, and seizures. The facioglossal weakness in BPP is likely the result of the topographic proximity of the respective primary motor centers and the affected perisylvian area.

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