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Erin Cameron Smith et al

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Methods: Data were collected using EPIC® starting 12 months prior to VNS replacement to Aspire® device to 12 months after implantation date in 3-month blocks. Seizure frequency before and after the VNS implantation as well as medication changes were identified from review of clinic notes. Cost was estimated based on the number of visits for ER, clinic, hospital, and ICU using hospital average cost data. As cost distributions are skewed to the right, we also calculated log total costs for the trend analysis using segmented model. For data analysis, segmented Poisson regression was used to establish a trend in usage per quarter.

Results: The trend in clinic usage was statistically flat (p > 0.05) in the pre-placement period while the trend in the post placement was downward with an estimate that for every quarter the natural log of the average number of clinic visits decreases by 0.29. By one-year post placement, the average number of clinic visits had achieved the same level as the pre-placement period. The trends in ER and hospital usage were flat in both the pre and post placement periods. The median number of CPS in the year after placement of the Aspire 106 VNS was statistically smaller by 1 (p = 0.0161) CPS than the median number of CPS in the year prior to placement.

Conclusion: Analysis of the above data yielded two main findings: there were no demonstrable cost savings within a 12-month period following VNS implantation, but the median burden of Complex Partial Seizures (CPS) within our cohort revealed a 50% decline, which was statistically significant. However, overall costs post-implantation showed a consistent downward trajectory, with approximation to pre-implantation costs within the 12-month timeframe.

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Diplopia and Vertical Gaze Palsy with Punctate Brain Stem Infarct
Jamison Hofer, Sachin Kedar, T. Scott Diesin, Daniel Zhou, Nicholas Swingle

Mentor: Sachin Kedar
Program: Neurology

Objective: To describe the clinical features, MRI findings, and neuroanatomy of a patient with a punctate brainstem stroke.

Method: Characterize the eye movement deficits in this patient and correlate the MRI diffusion restriction findings.

Results: This patient presented with vertical gaze palsy and impaired adduction of the left eye. Impaired smooth pursuits up and down clinically localized to damage in the interstitial nucleus of Cajal. Impaired saccades up and down localized to the rostral interstitial nuclei of the medial longitudinal fasciculus. MRI showed diffusion restriction in the left thalamus-midbrain junction just posterior to the red nucleus.

Conclusion: This case illustrates how a punctate single unilateral lesion can present with vertical supranuclear gaze palsy and horizontal eye movement abnormalities.

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Paroxysmal Autonomic Instability and Dystonia Following a Motor Vehicle Accident
Matthew Purbaugh, Krishna Galla, Marco A. Gonzalez Castellon

Mentor: Marco A. Gonzalez Castellon
Program: Neurology

Background: We were consulted a young adult patient who presented following a motor vehicle accident. The patient presented with diffuse axonal injury, hemorrhage of left basal ganglia increased intra-cranial pressure and other injuries. The patient was intubated, an intraventricular shunt had been removed and a 7-day course of Keppra prophylaxis had been finished. The patient was stable until the morning we were consulted.

Methods: On exam the patient had episodes of extensor posturing, diffuse dystonia and high frequency, low amplitude tremors, with autonomic instability limited to these spells.

The patient was found to have 3+ reflexes throughout. Brain stem reflexes were intact. Stimuli caused extensor posturing, rigidity and autonomic instability. Continuous VEEG showed epileptiform activity that did not correlate with spells on video. Lab was non-specific expect for a reelevated CK. We loaded Keppra and prn diazepam. This failed to control the symptoms.

Results: We arrived at a diagnosis of paroxysmal autonomic instability and dystonia (PAID) syndrome. Treatment with clonazepam, Gabapentin, baclofen and propranolol stabilized the autonomic system and resolved the dystonia. The CK began to drop and the patient began to respond to commands.

Conclusions: PAID most commonly affects young persons following severe TBI. Potentially caused by disinhibition of sympathoexcitatory regions leading to cortically provoked catecholamine surges causing autonomic instability. Dystonia is secondary to disruption of the pontine and vestibular nuclei. PAID should on the differential diagnosis of TBI patients who are not responding to typical treatments. We had success treating with Clonazepam, gabapentin, baclofen and propranolol.

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Diagnostic Challenges in The Radiographic Distinction Between Demyelinating Lesions and Primary Brain Neoplasms
Erin L. Smith and Geetanjali Rathore

Mentor: Geetanjali Rathore
Program: Neurology

Introduction: The differentiation between demyelinating lesions and primary brain neoplasms is difficult based on radiography alone, resulting in misdiagnoses and delay in treatment. Here we present two cases with MRI abnormalities suggestive of either demyelination or neoplasm. Case 1 was treated with steroids for a demyelinating process, but was found on biopsy to have an anaplastic astrocytoma that was unresectable by the time of diagnosis. Case 2 was thought to be glioma but was later determined to be tumefactive demyelination. In both cases, there were delays due to the limitations of MR imaging.

Methods: The cases of the two patients were reviewed via EMR. A literature review investigated the most sensitive and specific non-invasive diagnostic modalities for diagnosing demyelinating lesions or primary brain neoplasms.

Results: Review of recent literature shows that conventional MR sequences have
an established sensitivity of 80.9% and
specificity of 57.1% in differentiating
high-grade gliomas from tumefactive
demyelinating lesions. Some studies
suggest that even specimen biopsies
may be inconclusive, as there are many
histopathologic similarities between
tumefactive demyelinating lesions and
high-grade gliomas. Diffusion tensor
imaging (DTI), though not yet utilized in
common practice, can be highly sensitive in
differentiating these lesions.

Conclusions: For both patient scenarios,
MR imaging was insufficient to make a
definitive diagnosis, resulting in a delay in
treatment. The cases and literature review
demonstrate the diagnostic challenges of these
conditions using standard MRI alone, and
raise awareness of DTI and other non-invasive
modalities that may become integrated into
future clinical practice.

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Utilization of Brain Imaging in Evaluating Patients with Psychogenic Nonepileptic Spells
Danmeng Wei, Matthew Garlinghouse, Wenyang Li, Nicholas Swingle, Kaeli K. Samson, Olga Taraschenko

Mentor: Olga Taraschenko
Program: Neurology

Background: Psychogenic non-epileptic spells (PNES) are paroxysmal movements or
sensory events that resemble epileptic seizures but lack corresponding ictal electrographic
changes. Patients are often referred for brain imaging tests which contribute to the high
cost of care.

Methodology: This is a retrospective chart review of 225 adult patients diagnosed with
PNES without epileptic seizures from 2012 to 2017. The frequency of the brain imaging
tests prior to VEEG was assessed across all
semiological classes and was correlated with
other clinical characteristics.

Result: The most prevalent PNES events were characterized by semi-rhythmic small
amplitude movements in the extremities (32%) followed by those resembling clonic-tonic seizures (27%). Patients with sensory changes had more imaging tests than those
with primitive gesturing and axial posturing.
Patients with 3 or more psychiatric disorders had more combined MRIs and CTs prior to
diagnosis than patients with two or fewer psychiatic co-morbidities (p = 0.03).

Conclusion: The frequency of brain imaging obtained prior to the definitive diagnosis of
PNES is influenced by semiology and the
psychiatric health of patients. The PNES
with minimal paroxysmal movements in the
settings of multiple psychiatric co-morbidities represent particularly challenging patient
phenotype which is linked to excessive referrals for brain imaging.

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Disseminated Strongyloides Causing Diffuse Alveolar Hemorrhage
Mollie Brittan, Brian Boer, Deepak Chandra

Mentor: Brian Boer
Program: Internal Medicine

Case presentation: An elderly patient with a
past medical history of leukocytoclastic
vasculitis on high dose steroids presented with
altered mental status. The patient was found
to be in septic shock and was admitted to an
intensive care unit. The patient was started
on broad spectrum antibiotics but continued
to decline and developed hemoptysis along
with hypoxic respiratory failure requiring
intubation. Bronchoscopy revealed frank
bronchial and alveolar hemorrhage.
Bronchoscopy fluid was sent for microscopy
and it revealed nematodes consistent with
Strongyloides. The patient was started on
oral Ivermectin and Albendazole but failed to
improve on this regimen and was switched to
subcutaneous Ivermectin after FDA approval.
The patient ultimately improved and was
discharged.

Discussion: Strongyloides stercolis is a
nematode that can cause disease in humans.
Strongyloides infection can involve
cutaneous, pulmonary and gastrointestinal
systems. This organism has a unique lifecycle
where the parasite enters the host often
through the skin and migrates to both the
gastrointestinal and pulmonary systems
at various points during its lifecycle. This
unique life cycle also involves gastrointestinal
autoinfection. Autoinfection occurs when a
human is infected with a helminth (i.e.
Strongyloides) and the whole parasite’s
lifecycle takes place within the human host.
This process is exaggerated in humans
when cell mediated immunity is impaired
with immunosuppression (in the case of
our patient with corticosteroids). It has the
ability to spread to multiple organs during the
hyperinfection stage which can cause multi-
organ failure.

Conclusion: Diffuse alveolar hemorrhage
caued by disseminated Strongyloides has a
high mortality rate and treatment with
subcutaneous Ivermectin contributed to her
survival as the oral formulation had poor
absorption due to gastrointestinal involvement
of the parasite.

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Was It the Beer or the Burgers?
Ian Cormier, Craig Baumgart, Michael Smith

Mentor: Michael Smith
Program: Internal Medicine

Acute pancreatitis is a commonly encountered
diagnosis and is the most common
gastrointestinal reason for hospitalization.
Approximately 75% of cases of acute
pancreatitis are caused by gallstones
or alcohol consumption. In contrast,
hypertriglyceridemia only accounts for 2-4%
of acute pancreatitis cases.

A middle-aged patient with a history of
recurrent acute pancreatitis secondary to
alcohol abuse was admitted for acute
epigastic abdominal pain consistent with
his prior episodes of pancreatitis. Workup
was significant for multiple electrolyte
derangements and laboratory workers
commented on the patient’s serum appearing
lactescent. Repeat point-of-care testing
revealed normal electrolyte levels. A lipid
panel revealed profound hypertriglyceridemia
and the patient was treated with an insulin

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