

Challenging Pediatric Neurological Emergency Patients

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Global Objectives

- Improve care of the neuro patient
- Minimize morbidity and mortality
- Expedite disposition
- Optimize resource utilization
- Enhance our job satisfaction
- Maximize Rx options, success

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Perspectives

- We are not neurologists
- Many of us are not pediatricians
- Rare neuro problems occur rarely
- Can we evaluate them adequately?
- Can we put a name to them?
- Can we optimize consultation, disposition, and patient outcome?

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These Cases, This Session

- Six pediatric patients
- Focus on presentation, differential
- Answers the question: "What is it?"
- Some key concepts
- Further learning at www.ferne.org
- Full presentation, including audio, synchronized slides using Real technology, MP3 files for mobile use

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Generalized Weakness in a Ten-month-old Infant

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Case Presentation

- 10-month-old healthy female brought to pediatrician due to general weakness for twenty-four hours.
 - Increased Drooling
 - “Droopy Eyelids”
 - Difficulty latching onto breast
 - Poor suckle
- Dx- Otitis media and viral syndrome
- Tx- Begun on amoxicillin

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Case Presentation

- Returns to E.R. that evening with right arm weakness
- PMHx:
 - Term pregnancy without complications
 - Frequent middle ear infections
 - Recent URI in patient and sibling
 - No other medications or herbal supplements

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Case Presentation

- History (cont.)
 - Immunizations current
 - No recent travel or camping
 - Recent home remodel and waterline construction near home
 - No corn syrup or honey exposure
 - ROS: “loose” stools

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Case Presentation

- Physical Exam
 - Temp. 36.6 °C, P 147, R 34, O₂ sat. 99%, BP 126/73
 - Weakness in hands (R>L)
 - Poor head control
 - Difficulty sitting
 - Face symmetrical, Gag intact, 2+ DTRs

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Case Presentation

- Laboratory
 - CBC, Electrolytes, Spinal fluid, Urinalysis
 - WBC 13,000, CO₂ 17
 - Blood, Urine, Stool, and CSF Cultures
- Radiographs
 - CT of the head without contrast: Normal

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Case Presentation

- Hospital Course
 - Admitted to Neurology Service
 - Progressive Hypotonia
 - Nasogastric tube placed for feedings
 - Loss of gag reflex
 - Loss of facial expressions
 - Ptosis

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Botulism

- 3 distinct clinical infections
 - Wound
 - Food borne
 - Infantile
 - Adult- compromised host
- *Clostridium Botulinum* (*Baratii*, *Butyricum*)
- Gram + rod, obligate anaerobe – hardy spores
- Most potent toxin known to man

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Infantile Botulism: Background

- Van Ermengem – 19th Century
- Botulus - Sausage (Latin)
- First infant case reported in 1931
- Distinct clinical entity – 1976

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Infantile Botulism: Pathophysiology

- Toxin-infection versus ingestion
- Lack of competitive intestinal flora
- Neuroparalytic disease caused by heat-labile toxin
- Irreversibly binds to presynaptic nerve endings of cranial and peripheral cholinergic nerves
- Blocks calcium dependent exocytosis of acetylcholine vesicles

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Infantile Botulism: Epidemiology

- Reservoir: soil (surface of fruit and vegetables), marine life, birds, honey
 - ? Corn Syrup
- Seven toxin types (A-G)
- 90% of cases types A and B
 - Type A- West of the Mississippi
 - Type B- East to West Distribution
- 85% Indeterminate source
- Majority of U.S. cases are Infantile

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Infantile Botulism Clinical Presentation

- 95% of cases occur in the first 6 months of life
- Range: day of life 6 – 363
- SIDS association
- Descending neuromuscular blockade
 - Cranial nerves
 - Trunk
 - Extremities
 - Diaphragm

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Infantile Botulism: Physical Exam

- Autonomic findings (anticholinergic)
 - Labile blood pressure and heart rate
 - Decreased anal sphincter tone
 - Urinary retention
 - Flushed skin
 - Constipation

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Infantile Botulism Treatment

- Supportive
 - Await growth of new nerve endings
- Botulinum antitoxin (not used in infants)
 - Trivalent equine product against types A,B, and E available from CDC
 - Associated with anaphylaxis and serum sickness
- Antibiotics
 - may increase toxin production or enhance neuromuscular blockade (aminoglycosides)
- Botulinum Immunoglobulin (BIG) via CDC
 - Binds free toxin, halts progression of disease, and shortens length of hospitalization

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Conclusions

- Consider this diagnosis
- Historical factors may assist
- Appropriate lab testing
- Exclude more common etiologies

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A Case of Pediatric Pain

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University of Cincinnati College of Medicine
and
Greater Cincinnati / Northern Kentucky Stroke
Team



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Case History of Present Illness

- 12 yo Caucasian female who presents to the Emergency Department complaining of diffuse body pain
- Symptoms began one week ago originally in distal extremities but now throughout entire body
- Patient has missed school for the past 4 days due to pain with ambulation but she denies any weakness

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Case Past History

- Past medical history -
 - No significant past medical history
 - Mother notes that members of the family had a "stomach flu", including the patient, 3 weeks ago
- Social history -
 - Family recently moved to area, patient is having difficulty adjusting to new school
 - No alcohol or drug use
- Review of systems -
 - No fever, chills, chest or abdominal pain, rashes
 - Patient states it hurts to breathe

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Case Physical Exam

- VS: BP 98/60 HR 110 T 98.9°F SaO₂ 99%
- Tearful young female clinging to mom
- HEENT, pulmonary, cardiac, abdominal, extremity, skin exams all unremarkable
- Neuro exam -
 - Cranial nerves intact
 - Motor largely intact but limited by effort
 - Sensory shows extreme sensitivity to touch in all extremities and less so on trunk
 - Motor tone normal but reflexes absent
 - Patient refused to walk

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Case Laboratory Evaluation

- Chest xray unremarkable
- CBC and renal profile normal
- Hepatic with mildly elevated transaminases
- UA and urine pregnancy negative

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Case Disposition

- Discharge diagnosis: Viral syndrome
- Follow-up was scheduled with the patient's pediatrician the following week
- The physician also discussed with the patient's parents that her behavior may also reflect her difficulty with her new school

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Case Second E.D. Visit

- Patient returns 2 days later now complaining of profound weakness and shortness of breath
- VS: BP 130/78 HR 125 T 100.6°F
- General exam unchanged except increased shortness of breath
- Neurological exam now reveals:
 - CN OK except bilateral VII nerve weakness
 - Flaccid lower and weak upper extremities
 - Less pain to touch but burning sensation persists
 - Deep tendon reflexes remain absent

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What is Your Diagnosis?



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Guillain Barre Strohl Syndrome



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Pathophysiology

- First described in the 1930's GBS is an form of acute polyradicularneuropathy
- Primarily due to demyelination of peripheral nerves
- In severe forms actual axonal damage occurs (associated with worse prognosis)
- Numerous precipitants have been identified

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Clinical Findings

- **Motor**
 - Ranging from mild weakness to paralysis
 - Symmetric and ascending
 - Cranial nerves (IV, VI, VII) but rarely bulbar
 - Areflexia
- **Sensory**
 - Pain or dysesthesia very common
 - Visceral symptoms not infrequent

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Pain Syndromes in GBS

- **Back and leg pain**
 - Similar in presentation to sciatica
 - Affect large muscle groups
- **Neuropathic pain**
 - Burning sensations in the extremities
- **Visceral pain**
 - Bloating, cramping
- **Joint pain and myalgias**
 - Affects primarily large joints

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Laboratory Evaluation

- **Basic labs –**
 - Renal profile (SIADH seen in GBS)
 - CBC
 - Hepatic (elevations in transaminases common)
 - Pregnancy
 - ESR (typically < 50 mm/hr)
 - CK (elevated in patients with significant pain)
 - UA (proteinuria in 25%)
- **CSF –**
 - Usually with normal opening pressure
 - Classically with elevated protein (> 400 mg/dL)
 - Lack of pleocytosis

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Specific Laboratory Evaluations

- **Serum –**
 - Antibodies to GM1, Ga1C, or GA1NAc-GD1a gangliosides
 - Antibodies to *Campylobacter jejuni*
 - Antibodies to CMV
 - HIV
- **Stool cultures for *C. jejuni***

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EMG and Neuroimaging

- EMG
 - Demonstrates
 - Demyelination \pm axonal loss
 - Diminished nerve conduction velocities
 - Diagnosis more specific if multiple nerves involved
- MRI with gadolinium contrast
 - Enhancement of cauda equina and nerve roots suggest areas of inflammation

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General Treatment

- ABC's
 - Supportive and expectant care is key.
 - Early pulmonary function tests to identify patients at risk of impending respiratory failure
- Recognition and treatment of autonomic instability
- Immunomodulating therapies

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Treatment: Autonomic Dysfunction

- Paroxysmal hypertension
 - Sudden swings make treatment more difficult
 - Short acting agents safest (nitroprusside)
- Hypotension and orthostatic hypotension
 - Rarely requires therapy (IV fluids)
- Cardiac arrhythmias
 - Most life threatening
 - Bradycardia treated with atropine
 - Tachyarrhythmias may include atrial fibrillation, atrial flutter, and ventricular tachycardia, all respond to standard treatment

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Treatment: Immunomodulation

- Plasma exchange
 - Only therapy with proven benefit
 - May require multiple exchanges
 - Cautious use in patients with autonomic instability
- Immunoglobulin therapy (IV IgG)
 - Relatively easy to administer
 - Benefit unclear
 - Risk of viral (hepatitis C) transmission
- Steroids without benefit
(Cochrane Review, 2001)

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Treatment: Pain Syndromes

- Deep muscle ache in low back or large muscles
 - Nonsteroidal anti-inflammatory drugs
- Neuropathic pain
 - TCA's effective, use with caution in autonomic dysfunction
 - Carbamazepine
- Joint pain
 - Ice packs, nonsteroidal anti-inflammatory drugs
- Throat pain associated with intubation
 - Intermittent cuff deflation, tracheostomy

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GBS: Conclusions

- Guillian-Barre Syndrome should no longer have significantly mortality if properly diagnosed and treated
- Guillian-Barre may present with pain as the primary symptom in children
- The key differential is primary spinal cord injury, GBS, and tick paralysis

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Patient Outcome

- Patient required intubation within 24 hours of admission
- Plasma exchange performed 4 times over next 7 days
- Patient was extubated on hospital day 6
- Returned to school 4 weeks from admission
- Patient with minimal residual leg weakness at 6 months follow-up

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Headache With Right Upper Extremity Weakness and Dysphasia in an Adolescent

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Case Presentation

- 10-year-old boy brought ED for evaluation of headache, aphasia, and right upper extremity weakness
- One half hour prior to arrival the family had been at a shopping mall when the boy suddenly grabbed his head, cried out that he had a terrible headache, and sank to the floor without striking his head.
- No motor activity or urinary incontinence
- Parents noted that he was not using his right arm. He had two episodes of forceful, projectile vomiting.
- Difficulty with speech

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Case Presentation

- No PMH except for a heart murmur
 - Echocardiographically proven to be due to a bicuspid aortic valve.
- No history of trauma, headaches, or drug use
- There was no significant family history.

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Case Presentation

- Alert and in moderate distress, holding his forehead in his left hand
- BP 116/76, P 120, RR 18, T 97.6° C
- No sign of trauma, pupils were equal and reactive to light, fundi had sharp disk margins, and the neck was supple and nontender.
- Cardiac examination I/VI systolic ejection murmur
- CN II -XII were normal including EOM, and no facial droop

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Case Presentation

- Motor 5/5 strength in all muscles on the left side and the right leg, but there was 0/5 strength in all the muscles groups in the right upper extremity
- DTRs were +2 on the left: 0/2 on the RUE; toes were downgoing
- Sensation intact; right upper extremity localized pinprick
- No meningeal signs
- The patient could understand and carry out three-step commands
- Speech: Difficulty with naming, repetition

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Case Presentation

- Placed in a semiprone position with his head elevated at 45 degrees, and airway management equipment was readied at the bedside
- ECG monitor showed normal sinus rhythm
- Bedside glucose determination 80 mg / dL
- Blood was sent for a CBC, electrolytes, BUN, Cr, glucose, and PT, PTT
- Urine sent for a toxicology screen
- STAT noncontrast head CT was ordered

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Case Presentation

- The patient remained stable over the first hour in the ED except for one more episode of vomiting
- His aphasia persisted
- The arm weakness began to resolve
- All of the laboratory tests returned within normal limits

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Case Presentation: Summary

- 10 year old with sudden onset, severe headache and focal neurologic deficit
- Aphasia and hemiplegia
 - Indicated a lesion in the left frontal region
- No predisposing illnesses
- Normal blood sugar

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Clinical Course

- Demerol / Phenergan for symptoms
- Returned from CT (2 hours post onset of symptoms)
- Symptoms improving / headache persisting
- Vomited twice
- Noncontrast CT read as "normal"
- **Next test . . . ?**

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Clinical Course

- LP performed
 - Opening pressure 140 mm / H₂O
 - Clear fluid / no xanthochromia
 - Protein and glucose normal
 - No cells
- **Next test . . . ?**

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Decision Making

- Clinical presentation was not characteristic of a SAH or of a MCA stroke
- If SAH was a consideration, options included:
 - Observation and repeat LP
 - Angiogram

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Clinical Course

- Admitted for observation
- Symptoms resolved overnight with normal examination in the am
- EEG showed no abnormalities
- **Final diagnosis: Hemiplegic migraine**
- **3 months later, patient had a similar episode**

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Migraine

- Migraine with aura
- Migraine without aura
- Complicated migraines
 - Auroras lasting more than one hour
 - Ophthalmoplegic
 - Hemiplegic
- Migraine equivalents

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Hemiplegic Migraine

- Two types:
 - Familial
 - Non-familial (FHM) or sporadic
- Headache plus visual, sensory, aphasic, and or motor symptoms
 - Usually two aura types are present
 - Headache usually begins at the same time of the aura

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Hemiplegic Migraine

- FHM is autosomal dominant, inherited subtype
 - Gene mutation within the neuronal calcium channel
 - Aura is generally prolonged
- Usually begin before age 25
- Female:Male 3:1
- MRA demonstrated constriction / vasodilatation
- Prolonged symptoms (days) and infarction have been reported

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Hemiplegic Migraine: Treatment

- Serotonin receptor modulators
 - No studies using sumatriptan in children
 - Study in adolescents (12-18 years) has shown DHE and metoclopramide to be effective in 90%
 - Promethazine has anecdotely been advocated as the anti-emetic of choice in children
- Case reports suggest calcium channel blockers (verapamil) to be effective in FHM

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Conclusions

- Sudden severe headache: vascular etiology
- Strokes involving the MCA will usually involve face and arm
- Aphasia associated with a MCA stroke is described as "non-fluent" involving naming and difficulty with repetition (exacerbated by motor compromise)
- Hemiplegic migraine is a type of complicated migraine with a prolonged aura due to genetic mutation of the neuronal calcium channel
- Treatment of hemiplegic migraine involve serotonin modulating drugs; Ca channel blockers are a consideration

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A 17 Year Old Male That "Can't See and Can't Hear"

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Case Presentation

- 17 yo male presents to the ED
- CC: "I can't see"
- triage assessment:
 - normal vital signs
 - grossly normal vision
- outcome:
 - left waiting room prior to physician evaluation

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Case continued

- Represented to ED 24 hours later
- CC: "can't see, can't hear"
- triage assessment:
 - normal vital signs
 - grossly normal vision
 - grossly normal hearing

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History

- Source: per patient
- CC: can't see and can't hear
 - could not elaborate further
- ROS:
 - denied recent illnesses
 - denied nausea, vomiting, diarrhea
 - denied fevers, chills, URI
 - denied rashes
 - occasional headache

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History

- PMH/PSH: unremarkable
- Medications: none
- Allergies: none
- SH:
 - has one child
 - lives with mom
 - occasional ETOH and marijuana
 - denied other illicit drugs

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Exam

- Bright and alert
- walked into the treatment area without difficulty
- VS: 37.5°C, HR=72, BP=130/70, and RR=14

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Exam

- HEENT:
 - EOMI and without nystagmus
 - muddy sclerae
 - pupils mid-sized and reactive
 - TM's normal bilat
- NECK:
 - supple
 - no adenopathy
 - no bruits

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Exam

- CV:
 - regular rate and rhythm
 - no murmurs, rubs, or gallops
 - nondisplaced PMI
- RESP:
 - CTA
 - unlabored

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Exam

- Abdomen:
 - soft, nontender, nondistended
 - negative masses or hepatosplenomegaly
 - normal bowel sounds
- Skin:
 - negative purpura, petechiae, rashes, or track marks
 - several tatoos on arms and back
- Extremities:
 - well perfused, no edema

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Exam

- Neuro:
 - alert
 - normal gait
 - equal strength, normal tone
 - followed simple directions:
 - could see and pick up a pen and identify it
 - asked in normal tone of voice

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Exam

- Neuro:
 - directions frequently repeated
 - 'huh' and 'don't know'
 - typical teenage behavior?
 - seldom used full sentences
 - yes, no responses
 - unable or unwilling to cooperate with further exam
 - annoyed and frustrated
 - "going home"

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After Exam

- Patient jumped off gurney
- found restroom without assistance
- returned to treatment room without difficulty
- later found wandering in the hallway
 - "Huh?", "Huh?", "Waiting for my mom"
 - redirected to room
 - fell asleep

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Cousin's History

- Normal state of health until 2 d PTA
- 2 d PTA :
 - arrested for possession of marijuana
 - head banging while in cell
 - choked???
 - released to custody of mother early morning
 - not acting like self
 - jail experience

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Cousin's History

- 1 d PTA: (first ED visit)
 - awoke c/o "headache" and "can't see"
 - sleeping ALL DAY LONG
 - squinting and intermittently covering one eye
 - bumping into things at home
 - did not make sense when he talked
 - not acting like his normal self

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Summary

- 17 yo male not acting right
 - headache
 - "can't see, can't hear"
- not cooperative with exam
 - teenager or pathology
- 2nd ED visit for same complaint
- change from baseline mental status
 - sleeping a lot
 - not making sense when he talks

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Questions?

- What is the differential diagnosis?
- What initial laboratory tests should be drawn?
- What ancillary studies should be ordered?

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Results

- All blood work is NORMAL
- EKG and CXR are NORMAL
- Tox screen is positive for THC

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Evaluation continues

- Patient instructed to get into wheelchair for head CT
- Patient responded (fluently):
 - "Chairboot flies to the baseball"
- Cousin responds:
 - "that's what he has been doing"
 - "he ain't making no sense"
- Do you expect the CT to be abnormal?

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Head CT Results

- Head CT/MRI are ABNORMAL
 - bilateral watershed strokes
 - between MCA and PCA distributions
 - left frontotemporal parietal lesion
 - watershed between MCA and ACA

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ED Rx of Pediatric Stroke

- Extrapolated from adult literature
- IV, O₂, and monitor
- prevention of stroke evolution:
 - ASA therapy
- anticoagulants - likely benefit if:
 - arterial dissection, prothrombotic disorder, dural sinus thrombosis, embolic source identified for thrombosis

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Hospital Evaluation

- ASA therapy
- MRI, MRA, MRV
- echocardiogram and bubble study
 - valves, thrombus, PFO
- transcranial and carotid duplex

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Hospital Evaluation

- hypercoagulable studies
 - PT/PTT, INR, Factor V Leiden, homocysteine
 - protein C and S, antithrombinIII
 - anticardiolipin antibody
- HIV testing
- Lumbar puncture

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During Hospital Course

- Wernicke type aphasia
- visual agnosia
- fluent speech, poor content + circumlocutions
- impaired naming of visual stimuli but ok with tactile stimuli
- semantic paraphrasias and neologistic jargon
- normal motor exam

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Patient Outcome

- Etiology of stroke never identified
- Theory:
 - acute occlusion of bilateral carotids by manual pressure
 - ? Strangled in jail
- Progress:
 - continued visual perceptual problems
 - aphasia that interferes with his ADL's
 - impaired auditory comprehension

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"I Think My 17 Month Old Baby is Drunk"

Daniel P. Davis, MD
UCSD Emergency Medicine

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Case Presentation

- 17-month-old healthy female brought to ED by parents for staggering gait.
 - First noted by grandmother that day
 - Gastrointestinal illness several days prior
 - No fever, head trauma or ingestions
 - Grandmother with BP meds and "back pills" in house but doubts ingestion

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Case Presentation

- Exam
 - T 37.7 rectal, HR 144, RR 25, CR <2s
 - Awake/alert, nontoxic, appropriate
 - No external e/o trauma
 - Cardiopulmonary normal
 - Abdomen soft

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Case Presentation

- Exam
 - Normal, age-appropriate mental status
 - Normal head circumference and shape
 - Use of both extremities w/o ataxia
 - Symmetric strength and sensation
 - Normal EOMs and facial symmetry
 - Gait – persistent falling to right w/o pain

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Case Presentation

- Labs
 - WBC 17.4 with left shift, no bands
 - Chemistries normal
 - Hgb/Hct 12.2/36.8
 - Urine tox screen negative

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Case Presentation

- Radiographs
 - Head CT negative
- Procedures
 - Traumatic LP
 - 1400 WBC
 - 240,000 RBC
 - Gram stain negative

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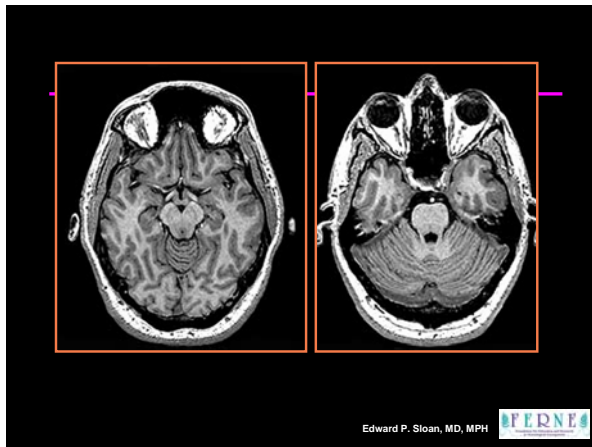




Case Presentation

- ED course
 - Remained afebrile
 - Normal neurologic
 - Persistent gait ataxia
 - Neuro consultation
 - Discharge home with no medications

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Acute Cerebellar Ataxia

- Definition
 - Rapid onset of ataxia
 - Usually <6 years of age
 - Usually prodromal illness
 - Usually benign and self-limited

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Acute Cerebellar Ataxia

- Many names to describe
 - Post-infectious cerebellar ataxia
 - Acute disseminated encephalomyelitis
 - Meningoencephalitis
 - Cerebellar encephalitis
 - Viral cerebellar ataxia
 - Post-varicella ataxia
 - Encephalomyelitis
 - Transient cerebellar ataxia

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Clinical Classification

- ACA
 - Gait ataxia
 - Usually complete resolution
- ADEM
 - Mixed sensory/motor and cerebellar
 - Patchy and bilateral
- ME
 - Sick patient

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Pathological Classification

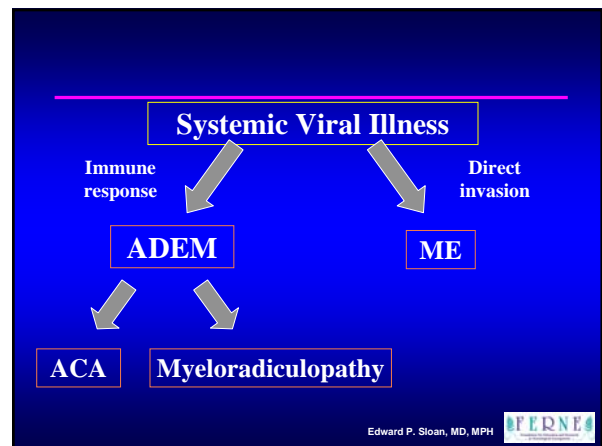
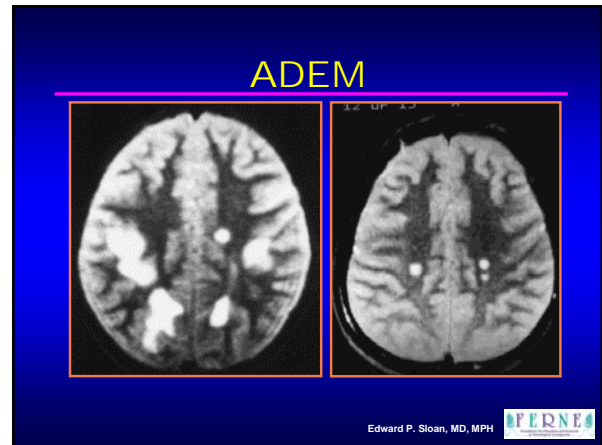
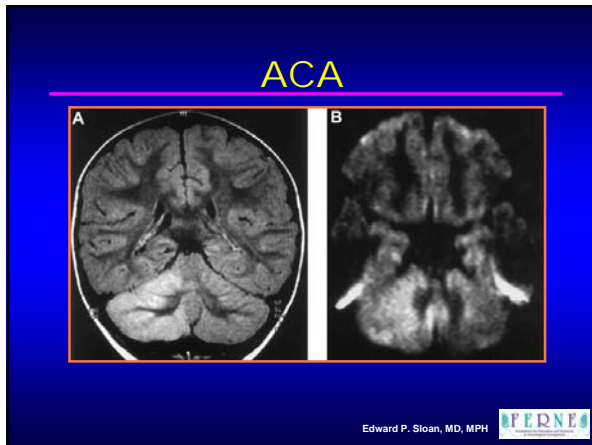
- ACA
 - Vascular inflammation without CSF penetration?
- ACA & ADEM
 - Anti-viral Ab and viral in serum
 - Often anti-viral Ab and virus in CSF
 - Autoantibodies
- ME
 - More direct viral invasion of brain tissue
 - More autopsy specimens available

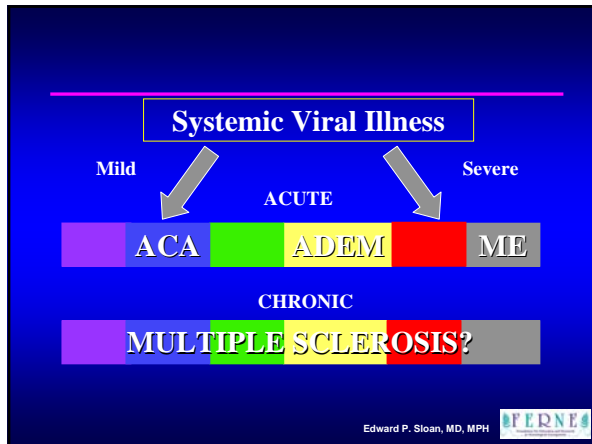
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Radiographic Classification

- ACA
 - Normal
 - Limited to cerebellum
- ACA & ADEM
 - Diffuse white-matter lesions (periventricular, cerebellar, basal ganglia, corpus callosum)
 - Identical to MS
- ME
 - Diffuse necrosis and edema

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- ### ED Approach
- Work-up
 - CT/MRI to rule-out serious illness
 - Meningitis/ME
 - Intracranial mass lesion
 - Tumor
 - Toxicology screen
 - Routine labs
 - LP

- ### ED Approach
- Treatment
 - Prophylactic antibiotics
 - Anti-bacterial
 - Anti-viral
 - Acyclovir
 - Pleconaril?
 - Steroids?
 - IVIg?

- ### Summary
- ACA and ADEM
 - Post-viral syndromes
 - ACA limited to cerebellum
 - ADEM diffuse CNS
 - Auto-immune link to MS?
 - Steroids? IVIg?
 - Viral invasion link to ME?
 - Anti-virals

- ### Summary
- Work-up and treatment focus on other potential etiologies
 - Intracranial mass lesion
 - Meningitis/ME
 - Toxic ingestion
 - Metabolic disturbance

- ### Patient Outcome
- Resolution
 - Outpatient MRI normal
 - Improved at 1 week F/U with neurology
 - Complete resolution in 2 weeks

A 9 Year-old Who Is Walking “Like He Is Drunk”

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Case Presentation...

A 9 year old young man was brought to the ED because he was “walking like he was drunk”, with speech difficulties and illegible hand writing. He had had these symptoms for over two days, and his pediatrician had obtained a plain brain CT, which was negative. He had no headache nor any visual changes.

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Case Presentation...

The child had fallen while riding his bike 12 days earlier, landing on his face, without LOC, as witnessed by his siblings. His mother saw him 30 minutes later, and noted him to be “a little dazed”, but otherwise OK. He had amnesia to the event, and complained of a diffuse headache for three days following the accident. His history was otherwise not contributory.

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Case Presentation...

On physical exam, he had some resolving abrasions and ecchymosis of the right malar eminence. Although he comprehended speech adequately, his own speech was sparse. He had diffuse weakness (4/5) of all extremities, and slightly hyperreflexia on his R side, including a positive Babinski's reflex on the R. He was noted to have cerebellar ataxia as noted on finger-to-nose and heel-to-shin movements of the R extremities. He had a moderately ataxic gait in the ED, especially with heel-to-toe walking.

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Clinical Questions

- What is your Differential Dx?
- What work-up would you do?
- What therapies would you provide?

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Case Outcome

- CT negative
- All metabolic, CNS, CV tests neg
- No infection
- No collagen vascular Dx
- No clear etiology determined

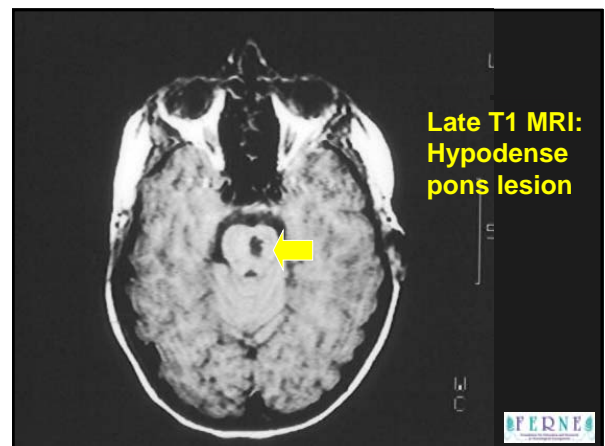
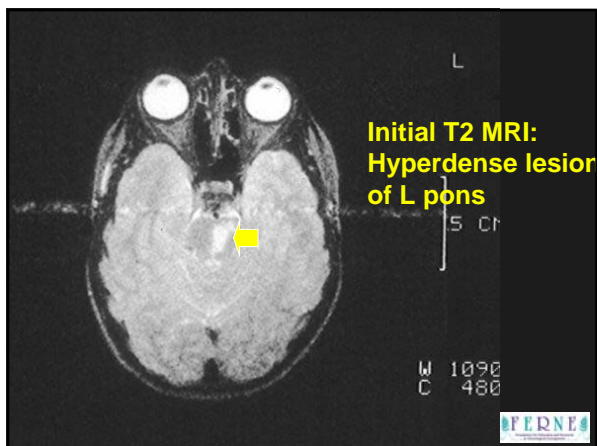
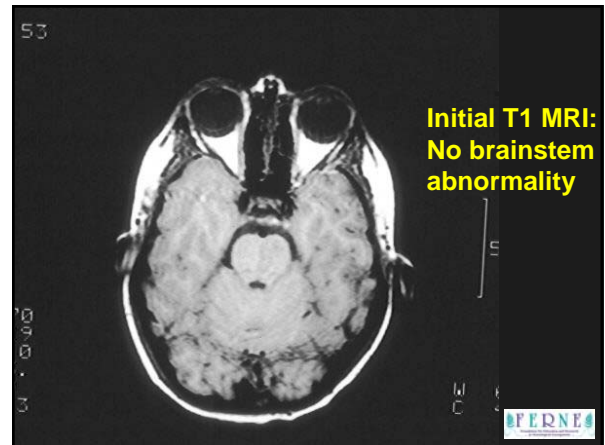
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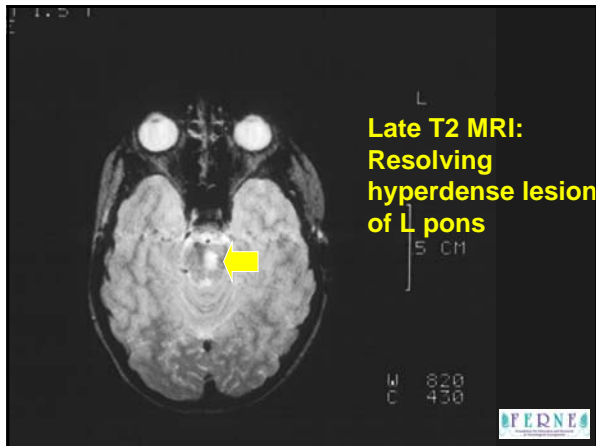


MRI Summary Findings

- Ischemic pontine infarct
- No hemorrhage
- Involvement of brainstem
- Resolution over time

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Patient Outcome

- Pt improved over 8 days in hosp
- Slight ataxic gait at discharge
- Full motor recovery
- Normal neuro at one month

- Four month MRI c/w stroke

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Head Injury and Peds Stroke

- Many case series and reports
- In series, 20-60% due to injury
- Often minor head trauma
- Often > 24 hours before sx onset

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Clinical Presentation

- Hemiparesis, speech abn, ataxia
- Transient blindness

- No large soft tissue injury
- Often no skull fracture evident

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ED Diagnosis in Peds Stroke

- Non-infused CT best first test
- Detects hemorrhage
- Will miss ischemic stroke signs

- DWI MRI to detect subtle changes
- MR angiography for vascular abn

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In-Hospital Evaluation

- Angiography or MRA
- LP
- Serum testing
- Echocardiogram
- Coagulation testing

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Non-Trauma Etiologies

- CNS vascular abnormalities
- Vasculitides
- Infectious causes
- Cardiac causes
- Hyper-coagulable states
- Demyelinating diseases
- Idiopathic ischemic infarct??

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Ongoing Stroke Therapy

- German study of recurrence
- 10% recurrence rate
- Same vessel, median 5 months
- LMWH vs. ASA
- No difference by therapy

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Proposed Stroke Etiology

- L medial pons infarction
- Paramedian branch of the basilar artery distribution
- Contralateral hemiplegia or hemiparesis, often with ataxia

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Proposed Stroke Etiology

- Injury due to shearing or stretching forces
- Intimal injury, delayed dissection, and infarction

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Conclusions

- Peds stroke important
- Can follow minor trauma
- Consider when making Dx
- Utilize CT, then MRI
- Provide head injury instructions

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Questions?

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