ED Headache Patients and COVID-19
Edward P. Sloan, MD, MPH, FACEP
June 4, 2020
EB Medicine

Emergency Department
Headache Patients:
with COVID-19 Concepts
Edward P. Sloan, MD, MPH, FACEP
Professor Emeritus
Department of Emergency Medicine
University of Illinois at Chicago

Attending Physician
Emergency Medicine
Carle Foundation Hospital

Medical Director
Physician Assistant Studies Program
Dominican University
River Forest, IL

Thank you to:
Sam Ashoo, MD
Erica Scott
Angie Wallace
Stephanie Williford
EB Medicine group.
June 4, 2020

No financial conflicts.
FERNE President and Board Chair.

Educational Objectives
ED Headache Patients and COVID-19
Edward P. Sloan, MD, MPH, FACEP

June 4, 2020
EB Medicine

Educational Objectives

• (1) increased competence (knowledge & strategy to use that knowledge in patient care)
• (2) improved performance-in-practice
• (3) improved patient outcomes.

Educational Objectives

• (1) Understand secondary headache etiologies
• (2) Know how ED headache patients present
• (3) Be able to diagnose and treat ED patients
• (4) Consider headache and COVID-19 factors

Overview

Content Literature

Evaluation and Management of Life-Threatening Headaches in the Emergency Department
• David Zodda, MD, Gabrielle Procopio, PharmD, Amit Gupta, MD
• Emergency Medicine Practice
• EB Medicine, February 2019, Vol 21, #2

CNS Pathologies

• Three involved structures:
  – CNS tissue (Brain and spinal cord)
  – Blood vessels
  – Meninges

• Primary and secondary headaches
Headache
Etiologies and Diagnoses

• 90% primary etiologies
  – Cluster
  – Migraine
  – Muscle-tension
• 10% secondary causes
  – Sinusitis, pharyngitis, vomiting & dehydration
  – Life-threatening secondary diagnoses

Secondary Headache Diagnoses

• Acute angle closure glaucoma
• Pregnancy induced hypertension
• Carbon monoxide poisoning
• Head and neck infections (sinusitis, pharyngitis, lymphadenitis)

Secondary Headache Diagnoses

• Subarachnoid hemorrhage
• Carotid & vertebral artery dissection
• Central venous thrombosis
• Idiopathic intracranial hypertension
• Giant cell arteritis
• Posterior reversible encephalopathy
• Meningitis/encephalitis
Headache History Items

- O Onset (Sudden onset?)
- P Provocative & Palliative (Exertional)
- Q Quality (Sharp, overwhelming?)
- R Radiation (Pain in neck?)
- S Severity (Severe, worst ever?)
- T Temporal (Constant, changing?)
- U Under care (Clinician, meds?)

HA History Associated Items

- Infection symptoms (ENT)
- Dehydration symptoms (NV, heat, poor PO)
- Stroke symptoms
- Cardiovascular symptoms
- Dizziness, near syncope, syncope
- Remote trauma
- Headache history

Headache Historical Red Flags

- Sudden, severe (Thunderclap) onset
- New onset age ≥ 50
- Neck pain (Significant)
- Malignancy history
- Immunocompromised
- Syncope
- Pregnancy / postpartum

Headache General Physical Exam

- VS: Fever, Abnormal VS, HTN, Cushing’s
- Well appearing? AMS? Dehydration?
- Pain or respiratory distress?
- Rash? Skin changes?
- Dysrhythmias?
- Chest, GI or GU infections?
Headache H(E)ENT Physical Exam

- H(E)ENT:
  - Sinus and temporal artery tenderness
  - TM and ear canal abnormalities
  - Pharyngitis, retropharyngeal abscess
  - Dental abscess
  - Nasal polyps, green discharge
  - Neck swelling, tenderness, bruits, Meningismus

Headache Eye Physical Exam

- Eye exam:
  - Visual acuity? (Vision loss, peripheral loss)
  - Visual field abn? (Field cut, tunnel vision)
  - Diplopia? (Vertical or horizontal gaze)
  - PERRL? (Marcus Gunn pupil)
  - EOMI? (Cranial nerve III, IV, VI deficits)
  - Lid lag? (CN III palsy)
  - Fundus ok? (Discs sharp or papilledema)

Headache Neurological Exam

- AVPU, Mental status
- Speech (Receptive or expressive aphasia)
- Dysarthria
- Motor functioning face and extremities
- Truncal ataxia, rhomberg, gait
- Coordination (FTN), abnormal reflexes
- Neuropsychiatric assessment

Headache Exam Red Flags

- Altered level of consciousness
- Seizure
- Fever
- Meningismus
- Visual acuity changes, cranial nerve abn
- Focal neurological deficit
- Psychosis

Headache Laboratory Testing
**Headache Lab Testing**

- Glucose (AMS)
- Pregnancy test (PIH)
- Basic labs: CMP, CBC, UA
- ESR, CRP (Limited sensitivity for GCA)
- Venous CO level
- D-Dimer (CVT excluded in low risk pts)*

**Lumbar Puncture**

- CT prior if herniation a concern (always)
- Opening pressure, left lateral position
- Obtain smallest amount, (≤ 1 cc) per tube
- #1 Hematology: cell count, differential
- #2 Chemistry: glucose, protein
- #3 Micro: gr stain, cx, virals, fungal
- #4 Hematology: cell count, differential

**Headache Neuroimaging**

**Non-contrast Head CT**

- Low yield (< 10%)
- High clinical utility (accurate, disposition)
- Initial test of choice in all ED patients that require neuroimaging
- Useful to exclude SAH, hemorrhage, abscess, space occupying lesions, edema, mass effect, midline shift

**ACEP Emergent Neuroimaging**

- Level B Recommendations:
  - (1) New abnormal findings in a neurologic examination (eg, focal deficit, altered mental status, altered cognitive function) should undergo emergent* non-contrast head CT.
  - (2) New sudden-onset, severe headache should undergo an emergent* head CT.
  - (3) HIV-positive patients with a new type of headache should be considered for an emergent* neuroimaging study.

*Emergent studies are those essential for a timely decision regarding potentially life-threatening or severely disabling entities.*
**ACEP Emergent Neuroimaging**

• Level C Recommendation:
  • Patients who are older than 50 years and presenting with new type of headache but with a normal neurologic examination should be considered for an urgent† neuroimaging study.

(Urgent studies are those that are arranged prior to discharge from the ED [scan appointment is included in the disposition] or performed prior to disposition when follow-up cannot be assured.)

**Other Headache Neuroimaging**

• CTA / CTP for ischemic stroke
• CTA for SAH (exclude aneurysm)
• MR Venogram for CV Thrombosis
• MRI for vasogenic edema in PRES
• CTA and/or MRA of head and neck if dissection suspected

---

**ACEP Emergent Neuroimaging**

Which patient does the ACEP Clinical Policy on ED headache evaluation and management recommend acute imaging for?

a. A new abnormal finding on neurologic examination
b. Headache and neck pain
c. An HIV-positive patient presenting with headache
d. A pregnant patient presenting with headache

**ACEP Emergent Neuroimaging**

Which patient does the ACEP Clinical Policy on ED headache evaluation and management recommend acute imaging for?

a. A new abnormal finding on neurologic examination

Explanation: Current ACEP Clinical Policy recommendations regarding emergent neuroimaging on patients presenting to the ED with acute headache are:

Level B Recommendations (Moderate Strength of Evidence):

• Patients presenting with headache and new abnormal findings in a neurologic examination (eg, focal deficit, altered mental status, altered cognitive function)
• Patients presenting with new, sudden-onset severe headache
• HIV-positive patients with a new type of headache

**US Imaging in Headache**

• Ocular ultrasonography
• Increased ICP assessment
• Sonographic optic nerve sheath diameter
• Normal optic nerve diameter up to 5 mm
• When > 5 mm, predicts ICP > 20 mm Hg
• Acts as bedside CT to assess elevated ICP
Headache Secondary Etiologies

Secondary Headache Diagnoses

- Subarachnoid hemorrhage
- Carotid & vertebral artery dissection
- Central venous thrombosis
- Idiopathic intracranial hypertension
- Giant cell arteritis
- Posterior reversible encephalopathy
- Meningitis/encephalitis

Secondary Headache Diagnoses

- Acute angle closure glaucoma
- Pregnancy induced hypertension
- Carbon monoxide poisoning
- Head and neck infections (sinusitis, periorbital cellulitis, pharyngitis, retropharyngeal abscess, lymphadenitis)

Subarachnoid Hemorrhage

- Most important secondary headache cause
- Sudden, severe (thunderclap) headache ***
- Maximal, severe intensity in minutes
- Significant morbidity & mortality risk
- Important ED diagnostic strategy
- Timing of this sudden ictus important
- CT / LP vs. CTA strategy
- ACEP clinical policy

Subarachnoid Hemorrhage

Subarachnoid hemorrhage on CT shows stellate collection of blood in a distribution similar to that of the Circle of Willis.
Likelihood Ratios

<table>
<thead>
<tr>
<th>Likelihood Ratio</th>
<th>Approximate change in probability</th>
<th>Effect on post-test probability of disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>−45%</td>
<td>Large decrease</td>
</tr>
<tr>
<td>0.2</td>
<td>−30%</td>
<td>Moderate decrease</td>
</tr>
<tr>
<td>0.5</td>
<td>−15%</td>
<td>Slight decrease</td>
</tr>
<tr>
<td>1</td>
<td>0%</td>
<td>None</td>
</tr>
<tr>
<td>Values between 0 and 1 increase the probability of disease (+LR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0%</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>+15%</td>
<td>Slight increase</td>
</tr>
<tr>
<td>5</td>
<td>+30%</td>
<td>Moderate increase</td>
</tr>
<tr>
<td>10</td>
<td>+45%</td>
<td>Large increase</td>
</tr>
</tbody>
</table>

Positive Likelihood Ratio Example
- Pre-test probability of SAH: 10%
- Positive LR of Symptom or Sign: 6.6
- Post-test probability increase: 35%
- Post-test probability: 45%
- Pre-test odds of SAH were 1 in 10
- Post-test odds of SAH now almost 1 in 2

SAH Findings & Positive LR

<table>
<thead>
<tr>
<th>Finding</th>
<th>Positive LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meningismus</td>
<td>6.6</td>
</tr>
<tr>
<td>c/o Neck stiffness</td>
<td>4.1</td>
</tr>
<tr>
<td>Focal deficit</td>
<td>3.2</td>
</tr>
<tr>
<td>Photophobia</td>
<td>2.3</td>
</tr>
<tr>
<td>Loss consciousness</td>
<td>1.9</td>
</tr>
<tr>
<td>Exertional onset</td>
<td>1.7</td>
</tr>
<tr>
<td>Sudden onset</td>
<td>1.3</td>
</tr>
<tr>
<td>Intercourse onset</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Ottawa SAH Rule: Inclusion

Inclusion Criteria:
- Age ≥ 15 years
- Glasgow coma scale score = 15
- New-onset severe headache
- Maximum intensity within 1 hour

Ottawa SAH Rule: Exclusion

Exclusion Criteria:
- Age ≥ 40
- Neurologic deficits, trauma, history of cerebral aneurysm, subarachnoid hemorrhage, brain tumors, chronic headaches, or papilledema
- Neck pain or stiffness
- Witnessed loss of consciousness
- Onset during exertion
- Thunderclap headache
- Limited neck flexion
Ottawa SAH Rule: EMR Info

Exclusion Criteria:
• If all neg, SAH unlikely (100% sensitive)
Develop into a dot phrase in EMR:
• Age < 40, neg hx, no LOC, no exertional onset, not thunderclap (not sudden, severe)
• No neuro deficit, no papilledema, no neck pain/tender/stiffness, no meningismus
• “Risk approaches zero, such that testing beyond non-contrast CT is not clinically indicated; pt aware, agrees.”

SAH Testing in Headache Patients

• ACEP Clinical Policy Acute Headache
• October 2008
• Adults, five Questions
• Three levels of recommendations based on strength of evidence
• Most recs are Level B, C
• Few Level A recommendations

SAH: CT Negative, Is LP Indicated?

• Level B Recommendation:
  • In patients presenting to the ED with sudden-onset, severe headache and a negative non-contrast head CT scan result, lumbar puncture should be performed to rule out subarachnoid hemorrhage.
  • This statement does not apply to other ED headache patients (nearly all ED patients).

SAH: LP vs. CT Angiography

• LP not useful when exam < 6 hours after ictus
• CT is useful when exam < 6 hours after ictus
• LP most often is of less value to rule out SAH
• Can CTA be performed following normal CT?
• Logic: if no aneurysm, then no SAH
• Why CTA? Good exam down to six branches
• For SAH, CTA clinically more useful than MRA
ED Headache Patients and COVID-19
Edward P. Sloan, MD, MPH, FACEP
June 4, 2020
EB Medicine

SAH Treatment

- BP management (SBP 160 mm Hg)
- Nimodipine, calcium-channel blocker
- 60 mg PO q4h
- Anti-epileptic drug therapy (limited data)
- Aneurysm management (clip, coil)

Subarachnoid Hemorrhage

Which of the following historical or examination findings is most suggestive of subarachnoid hemorrhage?

a. Sudden onset
b. Neck stiffness on examination
c. Focal neurologic deficit
d. Loss of consciousness

Subarachnoid Hemorrhage

Explanation: Perhaps the most distinctive historical feature of SAH is a headache described as “abrupt in onset,” a feature that is documented in 75% of SAH patients. Approximately 25% of these patients describe a transient alteration or complete loss of consciousness. Additional symptoms include neck stiffness, vomiting, and double vision.

Carotid & Vertebral Artery Dissection

- Neck pain
- Flexion/extension injury
- Anterior circulation stroke symptoms
- Hemiplegia, slurred speech
- Horner syndrome symptoms

Carotid Artery Dissection

Internal carotid dissection defect seen in a drawing and on MRA.
Head & Neck Pain, Horner’s

- 59-year-old female presents with headache and neck for one day after cleaning her closets the day before.
- Her neck is diffusely tender.
- She has a left eye ptosis and miosis.

Internal Carotid Artery Dissection

Horner’s due to sympathetic fibers stretching along ICA.

Vertebral Artery Dissection

- Neck pain
- Flexion/extension injury
- Posterior circulation stroke symptoms
- Dim vision, dizziness, diplopia, dysarthria, dyscoordination, hemi-sensory complaints

Cervical Artery Dissection Treatment

- Medical Rx to prevent stroke, regardless if spontaneous or traumatic
- Antiplatelet Rx = Antithrombotic Rx (CADISP)
- Extracranial dissection: IV heparin then oral anticoagulant
- Intracranial dissection: aspirin or clopidogrel
- No anti-coagulation?: aspirin or clopidogrel
- Not both ASA/Plavix for neuro dx (cardiac only)

Cerebral Venous Sinus Thrombosis

- Pregnant, postpartum, hypercoagulable
- Increased ICP signs, papilledema, CN VI palsy
- Neurological findings, stroke symptoms with hemiparesis and or posterior circulation sx, ataxia, seizures
### Cerebral Venous Sinus Thrombosis

- T2 MR image shows the venous cerebellar infarct (A) and MR angiogram shows the transverse sinus thrombosis (B).
- 3-month infarct resolution (C) despite persistent partial transverse sinus occlusion (D).

### Cerebral Venous Sinus Thrombosis Rx
- **Antibiotics** if infectious etiology suspected (Sinusitis, cavernous sinus thrombosis)
- **Anticoagulation Rx** is recommended, but...
- Up to 1/3 of CVT patients have hemorrhage
- MR imaging helps in hemorrhage diagnosis
- LMWH then oral anticoagulation

### Idiopathic Intracranial Hypertension

#### Idiopathic Intracranial Hypertension Rx
- LP, fluid withdrawal: temporizing measure
- Weight loss, low sodium diet
- Acetazolamide 250-500mg PO BID (Decreases CSF production)
- Modest improved visual field functioning
- Topiramate 25 mg PO QD alternate Rx
- Furosemide 20 mg PO QD alternate Rx
- Surgical options if refractory to medical Rx

### Giant Cell Arteritis
**Giant Cell Arteritis**

- Temporal artery tenderness
- Beading noted with palpation
- Jaw claudication
- Diplopia
- Vision loss
- Must include central retinal artery occlusion (CRAO) in differential of acute vision loss

**Giant Cell Arteritis Rx**

- High-dose methylprednisolone
- 15 mg/kg/day IV for up to three days
- Oral prednisone 40 mg / day to follow
- Biopsy indicated, even with normal ESR, CRP

**Posterior Reversible Encephalopathy Syndrome (PRES)**

- Acute onset headache
- Significant hypertension
- Loss of autoregulation of CNS vessels
- Altered level of consciousness
- Visual changes
- Seizures

**Posterior Reversible Encephalopathy Syndrome (PRES) Rx**

- Hypertension lowering to a “safe” range
- Consider 185/110 used for TPA evaluation
- Address mean arterial pressure Rx
- Lower MAP by up to 25%

**MAP Calculation and Rx**

- MAP = 1/3 systolic + 2/3 diastolic
- 120/90, MAP = 40 + 60 = 100 mm Hg
- 185/110 MAP, = 62 + 74 = 136 mm Hg
- 210/135, MAP = 70 + 90 = 160 mm Hg
- Lower by up to 25%, 160 – 40 = 120 mm Hg
- Can often safely only reduce MAP to 130 mm Hg (180/105) with no need to further reduce
**IV Anti-hypertensives**

- NTG, veno-dilator, when cardiac ischemia
- NTG at 10-200 mcg/min
- Esmolol, cardiac beta blocker, when tachycardic
  - 50-200 mcg/kg/min
- Labetalol, alpha 1 and beta blocker, esp if tachy
  - 20-40 mg every 10 minutes, up to 300 mg

**Meningitis & Encephalitis**

- Bacterial and viral meningitis
- If meningitis or encephalitis suspected, provide ceftriaxone prior to non-contrast CT imaging
- Steroid use only necessary for confirmed (cloudy CSF, positive LP) bacterial meningitis
- Strep pneumonia, group B Strep, N meningitidis, H influenza, Listeria monocytogenes
- Non-polio enteroviruses (group b coxsackie, echo)
- AMS possible with encephalitis (psych, fever)

**Meningitis & Encephalitis Rx**

- Neonates, 28 days: ampicillin, cefotaxime or gentamycin, acyclovir
- Infants: ampicillin, ceftriaxone
- Adults (18-49): ceftriaxone, vancomycin
- Adults (50+): ceftriaxone, vancomycin, ampicillin
- Foreign body/procedure: vancomycin and cefepime/cefazidime/meropenem
- PCN allergy: Moxifloxacin, vancomycin

**Acute Angle Closure Glaucoma**
Acute Angle Closure Glaucoma

• More common in older patients
• Sudden exposure to bright light, such as leaving a moving theatre to a sunny day
• Unilateral blurry vision, halos, vision loss
• Unilateral headache, behind the eye
• Eye pain and redness
• Elevated intraocular pressure > 30 mm Hg
• Normal IOP is 8-21 mm Hg (uptodate.com)

Acute Angle Closure Glaucoma Rx

• Medical Rx
  - Timolol, beta blocker, 0.5%, q1hr x 2 then q12 hr
  - Pilocarpine, miotic, 1-2%, 3x over 30 minutes
  - Apraclonidine, alpha 2 agonist, 0.5%, q1hr x 2
  - Ophthalmology for immediate laser therapy

Pregnancy Induced Hypertension

• HTN with associated sx and / or lab findings
  - SBP > 140 or DBP > 90 mm Hg x 2 four hrs apart
  - SBP > 160 or DBP > 110 mm Hg x 1
  - Plus proteinuria, thrombocytopenia, liver impairment, renal insufficiency, pulmonary edema, or new onset headache
  - The presence of the latter sx (not proteinuria) renders the disease more severe

Pregnancy Induced HTN Rx

• Pregnancy-induced hypertension
  - Labetalol 10-20 mg IV, hydralazine 5-10 mg IV
  - Nifedipine 10-20 mg PO
  - Severe pregnancy-induced hypertension
  - Mg sulfate 4-6 grams bolus over 30 minutes
  - Mg 1-2 grams/hour till muscle, reflex changes
Pregnancy Induced Hypertension

A 25 weeks’ pregnant patient presents with a blood pressure of 180/120 mm Hg. Which of the following associated symptoms requires IV magnesium therapy for the treatment of severe pre-eclampsia?

a. Proteinuria
b. New-onset headache
c. Protein/creatinine ratio ≥ 0.3 mg/dL
d. Serum creatinine 0.8 mg/dL

Explanation:

Pre-eclampsia is defined as elevated blood pressure with proteinuria or other severe symptoms in a pregnant patient at ≥ 20 weeks gestation. Proteinuria is no longer necessary to diagnose pre-eclampsia if other severe symptoms are present. Severe pre-eclampsia is defined as pre-eclampsia plus 1 of the following symptoms: thrombocytopenia, liver or renal impairment, pulmonary edema, or new-onset headache.

Carbon Monoxide Poisoning

- Headache, N/V, peripheral cyanosis
- Visual changes, AMS, coma, seizures
- Cardiac ischemia, cardiac arrest
- Venous CO level, smokers 3-8% COHb
- Lethal levels in the 40-60% range
- Prior HBOT for COHb > 24%
- HBOT now: AMI, cardiac arrest, coma, seizures
- High flow O2 otherwise

Head & Neck Infections

- Sinusitis, periorbital cellulitis, pharyngitis, retropharyngeal abscess, lymphadenitis
- Pain change with position change: sinusitis
- Head CT must exclude pansinusitis
- Periorbital vs orbital cellulitis
- Common infections commonly cause headache
- When in doubt, ceftriaxone prior to head CT
ED Headache Patients: COVID-19 Considerations

COVID-19 CNS Mechanisms

- COVID-19 virus uses ACE2 receptor for access
- ACE2 receptors in neurological tissues
- Brain access thru nasal olfactory epithelium and thru CNS capillary endothelial lining
- Potential for causing cerebral edema prior to diffuse organ system loss of homeostasis

Baig Targeting CNS Mech ACS Chem Neurosc March 2020

COVID-19 CNS Mechanisms

- Direct infection injury via blood neurons
- Hypoxic injury (given respiratory pathogen)
- ACE2 receptor cellular access
- Immune injury (SIRS)
- Infectious toxic encephalopathy, viral encephalitis, acute cerebrovascular disease

Wu Nervous System Involve Brain Beh Imm March 2020

COVID-19 CNS Complications

- Myalgia and headache common
- Direct viral invasion of all neurological tissues
- Myopathy, polyneuropathy, rhabdomyolysis
- Meningitis and encephalitis
- Anosmia, ageusia (loss of smell and taste)
- Post-viral autoimmune processes
- Encephalomyelitis, Guillain-Barre

Berger Nervous System J NeuroVir Apr 2020

COVID-19 Neuro Case Report

- 64-year-old Chinese patient, no medical history
- Fever to 38.5 C, cough, myalgias
- Lethargy, unresponsiveness 13 days later
- Dissociated speech, ankle clonus, Babinski and Chaddock signs, meningismus
- CT and LP negative
- Recovery and discharge 17 days later

Yin Neuro Sx J Med Vir Apr 2020
COVID-19 Neuro Symptoms

- Observational case series, Wuhan, China
- 214 patients, 41% severe (more neuro comps)
- 36% neuro complications in 3 categories
- CNS (dizzy HA, AMS, CVA, ataxia, seizure)
- Peripheral (taste, smell, vision, nerve pain)
- Skeletal muscle injury (neuromuscular)

Mao Neuro Comps Wuhan China JAMA Neuro May 2020

COVID-19 and Headache

- MEDLINE search
- 41,000 patients described
- Headache in 8-12%
- HA in two disease phases:
  - Acute headache in viral infection phase
  - HA with hypoxia and with cytokine storm

Belvis COVID 19 Headache Case Headache May 2020

COVID-19 Headache

- HA reported in 11-34% of hospital COVID-19 pts
- New, sudden-gradual onset, moderate-severe, throbbing or pressure, poor analgesic response
- Bilateral temporoparietal, frontal, or periorbital
- High relapse rate in active infection phase
- Possible peripheral trigeminal nerve endings or pro-inflammatory hypoxia and/or cytokines

Bolay COVID 19 Headache Headache May 2020

COVID-19 Meningo-Encephalitis

- 64-year-old woman, no psych hx
  - Psych ward, then tonic-clonic seizure (focal SE)
  - MRI normal, LP cw meningo-encephalitis
  - Treated with acyclovir, improved over 4 days
- 67-year-old woman, COVID positive for 17 days
  - Intense wake up HA, confused, bathroom syncope
  - Left sided stroke symptoms, MRI OK, CSF pleocytosis
  - Rx acyclovir, anbx, discharged after 4 days

Bernard-Valnet Mening-Enceph Eur J Neuro May 2020

COVID-19 Meningitis

- 24-year-old nine days into fever, HA, fatigue
- Unresponsive, emesis, lying on floor
- Transient generalized tonic-clonic seizures
- CSF COVID-19 detected
- MRI positive in lateral ventricle, temporal lobe, hippocampus suggestive of meningitis

Moriguchi Meningitis Encephalitis Int J Inf Sx Mar 2020

COVID-19 Orbital Cellulitis

- 12-year old Egyptian male, 3 days orbital swelling
- 15-year old male, 3 days orbital swelling
  - Ceftriaxone and vancomycin
  - CT: Ipsilateral pansinusitis, orbital cellulitis, epidural abscess
  - Case 1: Surgical intervention, anbx, improvement
  - Case 2: Surgery, persistent fever, complicated course

Turbin Orbital Cellulitis Sinusitis CNS Orbit Apr 2020

COVID-19 Headache Patients and COVID-19
Edward P. Sloan, MD, MPH, FACEP
June 4, 2020
EB Medicine
COVID-19 CNS Venous Thrombosis

- 59-year-old, 4 days fronto-temporal headache
  - DM, HTN, persistent, severe HA, fever x 1
  - CT superior sagittal, transverse, sigmoid sinus and U vein densities suggestive of thrombus, CTV negative
  - Represented 4 days later with stroke sx (unilateral weakness, slurred speech, expressive aphasia)
  - CTV re-read: sigmoid and transverse sinus defects
  - LMWH, NIHSS from 10 to 4 at 24 hours, d/c home

Hughes Cereb Venous Sinus Thromb Eur J Int Med 2020

COVID-19 CNS Thrombosis

- 64-year-old male, wake up stroke, L hemiparesis, SOB, no tPA
  - 16 days prior fever, myalgias, COVID 19
  - Tachycardia, HTN, hypoxic respiratory failure, ETI
  - CT: hypo-attenuation, loss gray-white differentiation
  - CTA: ICA high-grade stenosis; no IC occlusion
  - Repeat CT at 24 hours: cerebral edema, mass effect, R MCA and ACA territories

Goldberg CV Disease AJNR May 2020

ED Headache Patients, COVID-19

- ED Headache patient life threats can be ID’d
- Systematic evaluation is critical, with EMR help
- Subarachnoid hemorrhage can be excluded
- Infection and thrombosis must be considered
- COVID-19 makes common HA causes to occur
- Consider COVID-19 with these HA life threats
- No need to alter Dx, Rx with COVID-19 pandemic

Headache and COVID-19

All of the following are true about headache patients and COVID-19 infection EXCEPT:

- a. CNS complications, including headache, can occur as a result of the viral illness, direct CNS viral attack, and secondary effects such as hypoxia or cytokine storm.
- b. COVID-19 can cause headache due to CNS infection and CNS thromboembolic complications.
- c. COVID-19 causes illnesses such as periorbital cellulitis to present differently than when caused without COVID-19. (False statement.)
- d. COVID-19 complications can include CNS, peripheral nerve, and neuromuscular injury.

Questions?
ferne.org@gmail.com