EM CASE OF THE WEEK.

BROWARD HEALTH MEDICAL CENTER
DEPARTMENT OF EMERGENCY MEDICINE

BROWARD HEALTH
Care Warriors

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Severe Headache and Agitation

A 52-year-old male with history of diabetes and hypertension presents to ED with new onset severe headache with nausea and vomiting preceding it for 2 days duration. Patient presented severely agitated and uncooperative.

Temperature was 103.6 F with white blood cell count of 13,000. Vitals are within normal limits. He is grossly neurologically intact. The rest of the exam is essentially unremarkable.

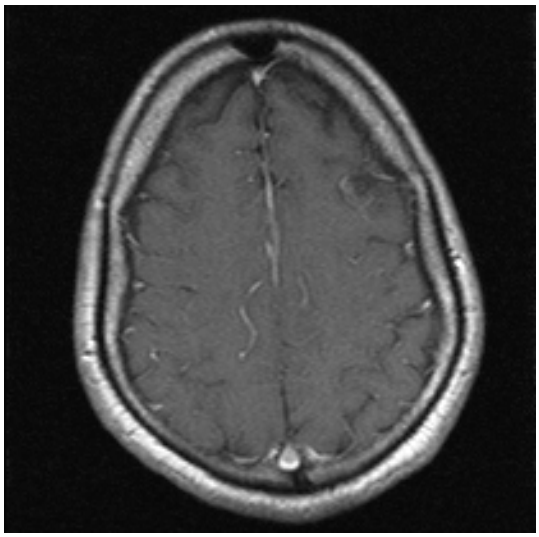
What is the next best step?

A. CT scan
B. Lumbar Puncture
C. Empiric antibiotics then dexamethasone
D. Dexamethasone then empiric antibiotics

What are the most sensitive clinical clues that suggest bacterial meningitis – without these symptoms we could essentially rule it out? (More than one choice may be correct)

A. Nausea and vomiting
B. Severe headache
C. Agitation
D. Fever

On Follow Up: Patient was treated with empiric antibiotics and returned to ED with new onset seizures. CT brain read as suspicious and an MRI was ordered, as shown below.



Radiologist read it as possible brain abscess, and recommended CT orbit/face to assess bony integrity of frontal sinus and orbital roof on left.

At the time of write-up, patient did not require neurosurgical intervention, as MRI findings were inconclusive. However, ID recommended starting on IV Ceftriaxone for 4-6 weeks for possibility of abscess with serial MRIs as outpatient to assess length of treatment. Patient is restricted from driving until 6 months being seizure free.

EM Case of the Week is a weekly "pop quiz" for ED staff.

The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

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The correct answers are 1.) D [patient has high risk factors, ie diabetes, and should have CT before LP without delaying antibiotic therapy] 2.) C & D [Absence of fever, neck stiffness, and altered mental status essentially rule out bacterial meningitis]. Left anterior frontal lobe epidural abscess versus left coronal infarct.

Bacterial Meningitis

Meningitis is defined as an inflammation of the membranes of the brain or spinal cord. It presents classically with **fever**, **neck stiffness**, and **altered mental status** *(absence of all 3 rules out meningitis with a sensitivity of 99-100%).* In the United States, there are 5-10 cases per 100,000. Men are affected more often than women. Incidence is more common in late winter and early spring.

It is a clinical syndrome that varies from being self-limited to life threatening and may be a result of polymicrobial infections to noninfectious processes. The clinical symptoms are difficult to distinguish between different etiologies, therefore it is vital to assume bacterial infection unless proven otherwise.

Etiology for bacterial meningitis

The etiology of bacterial meningitis varies greatly and age impacts frequency of certain species. In U.S adults, *S. pneumonia* is responsible for 71% of cases, followed by *N. meningitides* for 12% of cases.

Pathophysiology & risk factors for bacterial meningitis

There are three major mechanisms responsible for developing meningitis.

1. **Nasopharyngeal colonization** and mucosal invasion to bloodstream followed by crossing over blood-brain barrier to enter CSF.
2. **Localized source of infection** leading to bacteremia and CNS invasion
    a. i.e. IV drug use, endocarditis
3. **Direct entry into CNS** either by contiguous infection (sinusitis, mastoiditis), trauma, neurosurgery, CSF leak

Being **immunosuppressed** will decrease ability to prevent bacterial invasion into CNS. This is notable in the extremes of age (<5yo, >60yo), HIV, diabetes, alcoholism\cirrhosis, splenectomy, sickle cell disease, organ transplants.

Clinical features for bacterial meningitis

The constellation of symptoms and accompanied sensitivities that present with CNS infection includes fever (95%), nuchal rigidity (88%), altered mental status (78%). Additional findings are common, but not specific.

It's important to note that more subtle presentations can occur in *immunosuppressed* and *geriatric patients*. Not uncommonly can the only presenting sign be altered mental status.

Complications

Cardiorespiratory failure	Seizure disorder
Septic shock	Cerebral infarcts
Hyponatremia	Subdural
(*Cerebral Na wasting/SIADH)*	Cranial nerve injury
Cerebral edema/Increased ICP	(Commonly CN 8)

Assessment of risk

1.) Hypotension		0 symptoms: 9% risk
2.) Altered mental status	=	1 symptom: 33% risk
3.) Seizures		2-3 symptoms: 56% risk

Each of these clinical findings is independently associated with an adverse outcome of *death* or *neurological deficit* at time of discharge.

Work-up

Analyzing CSF is only definitive way to diagnose meningitis. However, lumbar puncture may cause brain herniation in the setting of increased intracranial pressure. This may be avoided with a CT brain prior to LP, but this practice is *costly* and causes *unnecessary time delays* for diagnosis and initiation of empiric antibiotic therapy.

High-risk features warranting screening CT scan [7]:

- Age > 60 years-old
- Compromised immune status
- History of CNS disease
- New onset seizure within 1 week
- Abnormal level of consciousness
- Detectable neurologic abnormality

If patient has at least 1 of these findings, a screening head CT should be obtained prior to LP.

For a list of educational lectures, grand rounds, workshops, and didactics please visit ***BrowardER.com*** and **click** on the ***"Conference"*** **link**.

All are welcome to attend!

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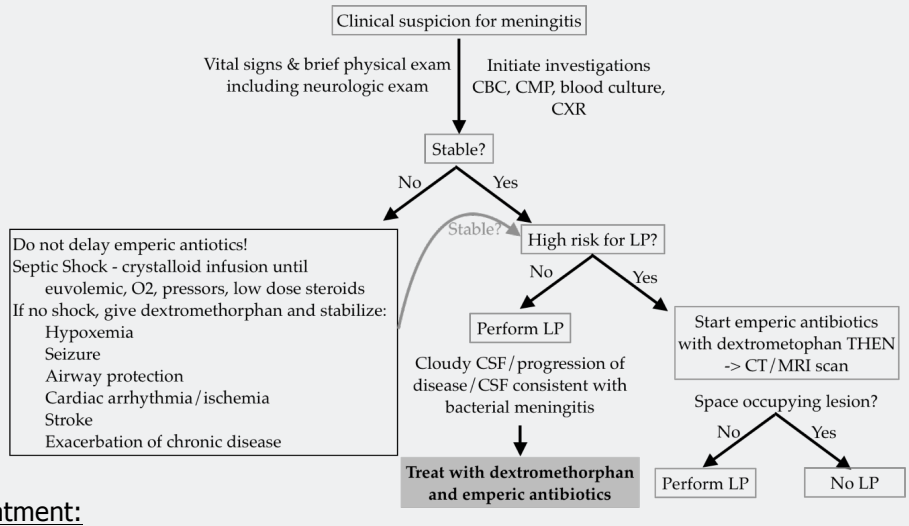

Treatment:

Empiric antibiotic selections are dependent on age and risk factors.

-Age: *<1 month*	Ampicillin + (cefotaxime or aminoglycoside)
1 month - 50 years	Vancomycin + 3rd gen cephalosporin
>50 years	Vancomycin + 3rd gen cephalosporin + ampicillin
-Basilar skull fracture	Vancomycin+ 3rd gen cephalosporin
-Penetrating trauma/ Neurosurgery/ CSF shunt	Vancomycin + (cefepime or ceftazidime or meropenem)

Adjuvant use of *dexamethasone* [6]*:*

- Clinical trials suggest use of glucocorticoids reduce mortality among patients with S. pneumonia meningitis[3] and suggested reduction of neurologic deficits such as hearing loss among high-income countries.
- Dexamethasone should not be given *after* antibiotic administrations as it will unlikely improve clinical outcomes. It's recommended to be given **15 minutes before or with antibiotics** for 4 days every 6 hours.

Take Home Points

- Meningitis is an infection of the cerebrospinal fluid and membranes of the brain
- It presents with **at least 1** of the following symptoms: Fever, stiff neck, altered mental status
- 80% of cases are infections are caused by *Streptococcus pneumoniae and Neisseria meningitidis*
- Risk factors include extremes of age, immunosuppression, trauma exposing epidural space
- Complications may lead to seizures, shock, cardiopulmonary compromise, focal neurological deficits including hearing loss
- Lumbar puncture is essential for diagnosis, but must be preceded by CT in high risk patients
- Empiric antibiotic therapy is based primarily on age and risk factors
- Use of dexamethasone may help decrease mortality and neurologic sequelae

This month's case was written by Chris Andriano. Chris is a 4th year medical student from NSU-COM. He did his emergency medicine rotation at Broward North Medical Center in Jan 2017. Chris plans on pursuing a career in Physical Medicine and Rehabilitation after graduation.

REFERENCES

[1]Attia, John. "Does This Adult Patient Have Acute Meningitis?" *Jama* 282.2 (1999): 175. Web.

[2]Beek, Diederik Van De, Jan De Gans, Allan R. Tunkel, and Eelco F.m. Wijdicks. "Community-Acquired Bacterial Meningitis in Adults." *New England Journal of Medicine* 354.1 (2006): 44-53. Web.

[3]Brouwer, Matthijs C., Peter Mcintyre, Kameshwar Prasad, and Diederik Van De Beek. "Corticosteroids for acute bacterial meningitis." *Cochrane Database of Systematic Reviews* (2015): n. pag. Web.

[4]"Clinical features and diagnosis of acute bacterial meningitis in adults." *UpToDate*. N.p., n.d. Web. 20 Jan. 2017. <http://www.uptodate.com/contents/clinical-features-and-diagnosis-of-acute-bacterial-meningitis-in-adults>.

[5]"Epidemiology of bacterial meningitis in adults." *UpToDate*. N.p., n.d. Web. 20 Jan. 2017. <http://www.uptodate.com/contents/epidemiology-of-bacterial-meningitis-in-adults>.

[6]"Dexamethasone to prevent neurologic complications of bacterial meningitis in adults." *UpToDate*. N.p., n.d. Web. 20 Jan. 2017. <http://www.uptodate.com/contents/dexamethasone-to-prevent-neurologic-complications-of-bacterial-meningitis-in-adults>.

[7]Hasbun, Rodrigo, James Abrahams, James Jekel, and Vincent J. Quagliarello. "Computed Tomography of the Head before Lumbar Puncture in Adults with Suspected Meningitis." *New England Journal of Medicine* 345.24 (2001): 1727-733. Web.