


**FERNE / MEMC IV Brain Illness and Injury Course:
Evaluation & Management of Delirious Patients with Suspected CNS Infection**
Thomas Lukens, MD, PhD, FACEP, FAAEM

Evaluation & Management of Delirious Patients with Suspected CNS Infection

Thomas Lukens, MD



FERNE Brain Illness and Injury Course

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The Fourth Mediterranean Emergency Medicine Congress (MEMC IV)
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4th Mediterranean Emergency Medicine Congress
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Thomas Lukens, MD



Thomas W. Lukens MD PhD
Associate Professor

Department of Emergency Medicine
MetroHealth Medical Center
Case Western Reserve University
School of Medicine
Cleveland, OH

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Greetings from Cleveland, Ohio




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Disclosures

- ACEP Clinical Policies Committee
- Advisory Board, FERNE

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Today's Objectives

- Present a typical clinical situation
- Discuss the diagnosis of delirium
- Review methods to diagnosis CNS infections
- Consider treatment options

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Clinical Case

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"Not feeling well"

- 68 year old male brought in by son
- 3 days of "not feeling well"
 - 2 days decreased alertness, intermittent confusion, anxious. Today thought he saw his deceased wife.
 - Patient had fever at home, complaints of headache, myalgias
- PMH- BPH, HTN, former alcoholic,
 - No psychiatric history
- Medicines: Lisinopril, Doxazosin, ASA

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"Not feeling well"

- B/P 145/90, HR 118, RR 20, T 38.5
 - Finger stick Glucose 100
- Exam- Confused, slurred speech, disinterested, somewhat uncooperative
 - Skin- no rash
 - Fundi- unable to visualize, pupils equal & reactive
 - Neck supple, positive Kernigs
 - Abdomen – soft, nontender, Lungs- clear
 - CN – 2-12 intact, strength- symmetrical, gait- wide based

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"Not feeling well"

- Consider his presentation- consistent with:
 - Psychosis
 - Alcohol withdraw
 - Dementia
 - Delirium
 - Metabolic
 - Acute MI

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Delirium

- A: **Disturbance of consciousness** (reduced clarity of awareness of the environment) with reduced ability to focus, sustain or shift attention
- B: **Change in cognition** (eg. memory deficit, disorientation, language disturbance) or development of a perceptual disturbance not due to pre-existing, established or developing dementia
- C: **The disturbance develops over a short period of time** (hours to days) and tends to fluctuate during the course of the day.
- D: **Evidence of etiology**

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Impression

- Patient with acute delirium and possible infection- related?
 - Infection – a common cause of delirium
 - 35% in one series
 - Drug interactions- also common
 - Anticholenergic effects
- Delirium - common in elderly patients in the ED

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Etiology Delirium

- D: **Drugs** anticholinergics, ETOH
- E: **Endocrine** BS, Na, Ca, Mg, cortisol, etc.
- M: **Metabolic** organ failure, hypoxia, etc.
- E: **Epilepsy or seizures** postictal status
- N: **Neoplasm** especially SIADH, CNS
- T: **Trauma** concussion, surgery
- I: **Infection** any
- A: **"Apoplexy"** any vascular event MI, PE, CVA

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Learning Objectives and Key Clinical Questions

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Session Objectives

- Discuss – how to evaluate this patient for cause of his delirium ?
- Review – Rapid diagnostic testing
- Determine- appropriate treatment
 - CNS Infection
 - Agitation

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Key Clinical Questions

- What are the indications for LP?
- When should a CT be performed before the LP.
- When should an opening pressure be determined? When is it positive?

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Key Clinical Questions

- How can CNS viral infection be differentiated from bacterial infection using CSF analysis.

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Key Learning Points

- **Initial treatment:**
 - **Blood cultures, IV fluids, urine analysis**
 - » Large majority of patients with bacterial meningitis have positive blood cultures
 - **IV antibiotics- Ceftriaxone**
 - » Add Ampicillin (Listeria) age > 50
 - **CT scan- signs of increased ICP**

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CT scan

- **CT scan indicated before LP:**
 - **Clinical findings predictive of abnormal CT**
 - Immunocompromised - HIV, transplant
 - Hx CNS lesion- tumor, abscess, stroke
 - New onset seizure- within 1 week
 - Papilledema- without venous pulsations
 - Abnormal level consciousness
 - Focal neuro deficit- dilated nonreactive pupil, gaze palsy, arm/leg drift, new visual field cut

Hasbun R, *NEJM* (2001); 345:1727

Tunkel AR, *Clinical Infectious Disease* (2004); 39:1267

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Herniation Risk

- **Overall – very low**
- **Normal CT doesn't r/o ↑ ICP**
 - Brain shift
 - Loss of grey- white differentiation
- **Meningitis- can lead to ↑ ICP**
 - Rennick- 4.3% herniation rate
 - Pediatric population
 - Flexor or extensor posturing, focal neurological signs or no response to pain- defer the LP

Rennick G. *British Medical J* (1993);306:953

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Lumbar Puncture

- **Lumbar Puncture - Standard of care with suspected meningitis**
- **Procedure options:**
 - Coagulopathy- reverse- replace factors, platelets
 - Herniation risk- treat without LP
 - Lateral decubitus position- opening pressure
 - Sitting position- more first time success
- **Opening pressure- not needed for meningitis detection**
 - If elevated > 250 mmHg, still take specimen

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CSF: Rapid Results

- **Chemistries: protein, glucose**
 - Glucose ~ 60% of serum value, decreased with infection
 - Protein – elevated in meningitis almost always
- **Gram stain**
 - 60-90 % positive, specificity > 97%
 - Likelihood + Gram stain related to concentration of bacteria in CSF
- **Latex agglutination**
 - Rapid, fairly sensitive: 65-100%
 - False positives, results don't change therapy
 - Not recommended

Tunkel AR, *Clinical Infectious Disease* (2004); 39:1267

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CSF

- **PCR- detects amplified pathogen DNA**
 - High sensitivity, use when Gram stain negative
 - Broad based PCR- negative predictive value ~100%
 - Not routinely recommended
- **CSF lactate- elevated in bacterial infection**
 - Non specific, not recommended as routine test
- **C-reactive protein- mirrors inflammation**
 - Not diagnostic for bacterial meningitis
 - Distinguish viral from bacterial ?
 - Not routinely recommended


Tunkel AR, *Clinical Infectious Disease* (2004); 39:1267

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CSF


- **CNS infection interpretation:**
 - Viral - lymphs predominant
 - Bacterial - polys predominant
- **Predictive model - 2002**
 - Pediatric population, retrospective
 - 0- 6 scale
 - 100% negative predictive value of score = 0

Nigrovic LE, *Pediatrics* (2002);110:712 Thomas Lukens, MD 

CSF Predictive Model


0 to 6 score

Predictor	Present	Absent
Positive Gram stain	2	0
CSF protein > 80mg/dl	1	0
Peripheral ANC > 10,000cells/mm ³	1	0
Seizure at or before presentation	1	0
CSF ANC > 1000 cells/mm ³	1	0

Nigrovic LE, *Pediatrics* (2002);110:712 Thomas Lukens, MD 


Empiric treatment

- **Antibiotics**
 - Ceftriaxone or Cefotaxime
 - Vancomycin + Ceftriaxone (Cefotaxime)
 - Combination recommended in infants/children
 - Some recommend in adults as well
 - Ampicillin > age 50-55 (Listeria)
 - **Timing of antibiotics?**
 - No prospective data
 - As soon as possible

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Empiric treatment

- **Steroids: dexamethasone -Adults**
 - Before or with 1st dose of antibiotics (0.15mg/kg q 6h x 2-4 days)
 - Mortality benefit in pneumococcal meningitis
 - Less neurological sequelae
 - Trend toward mortality benefit in meningococcal meningitis but not significant

Cochrane Database Syst Rev (2007) Jan 24;(1) Thomas Lukens, MD 


Delirium

- During the ED stay, the patient became increasing agitated and difficult to verbally de-escalate and reassure.
- **Treatment ?**
 - Restraints
 - Benzodiazepines
 - Antipsychotics
 - Psychiatry

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Delirium treatment

- Benzodiazepines are as effective as haloperidol in controlling agitation
 - IM Midazolam, IM Lorazepam
 - Haloperidol less rapid effect than droperidol
 - Combination therapy also effective- lower dose of each needed
- Atypical antipsychotics- not proven more effective than benzodiazepines or haloperidol in delirium

ACEP Clinical Policy. *Ann Emerg Med* (2006);47:79 Thomas Lukens, MD 

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Conclusions

- Delirium is a medical emergency
- Rapid determination of etiology is fundamental
- Meningitis is a cause of acute delirium and needs early recognition
- Emergent antibiotics and LP if meningitis suspected

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Recommendations

- CT scan before LP if specific clinical findings present
- Ceftriaxone (Cefotaxime) – initial empiric therapy
 - Add vancomycin, ampicillin as clinical picture dictates
- Steroids before antibiotics
- Agitation pharmacologic treatment
 - Benzodiazepines +/- haloperidol

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Questions?

www.FERNE.org

tlukens@metrohealth.org

216 778-3537

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