



**FERNE / MEMC IV Brain Illness and Injury Course:  
Lumbar Puncture Procedure  
Heather Prendergast, MD, MPH, FACEP**


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**Lumbar Puncture:  
Indications and  
Procedure**

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***FERNE Brain Illness  
and Injury Course***

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**4<sup>th</sup> Mediterranean  
Emergency Medicine  
Congress  
Sorrento, Italy  
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**Disclosures**


- None

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**Session Objectives**


- Present a relevant patient case
- Discuss the indications and contraindications for lumbar puncture (LP)
- Review the procedure of LP
- Present techniques to minimize post LP headache
- State the indications for opening pressure determination and interpretation of measurements

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## A Clinical Case

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## ED Presentation


- 77 yo previously healthy female
- 3 day history of confusion, and lethargy
- Glasgow Coma Scale 13 (E4,V4,M5)
- Key Aspects of Physical Exam:
  - Unable to cooperate with full physical examination, +neck stiffness upon neck flexion

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## ED Course

- Basic Labs
  - CBC, Electrolytes normal
  - Urinalysis: normal
  - Chest radiograph: normal


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## Why Consider This Case?


**Utility of lumbar puncture in the afebrile vs. febrile elderly patient with altered mental status: a pilot study**

Kaushal Shah MD<sup>1,2</sup>, Kathleen Richard<sup>1</sup> and Jonathan A. Edlow MD<sup>1</sup>  
<sup>1</sup>Dartmouth Medical School, Hanover, New Hampshire  
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## Lumbar Puncture

- Diagnostic Test for infectious and noninfectious neurologic conditions
- Rarely diagnostic as a single agent
- Combine with history, physical and selected lab tests

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## Indications for Lumbar Puncture

- Diagnosis of central nervous system (CNS) infection
- Diagnosis of subarachnoid hemorrhage (SAH)
- Evaluation and diagnosis of demyelinating or inflammatory CNS processes
- Infusion of anesthetic, chemotherapy, or contrast agents into the spinal canal
- Treatment of idiopathic intracranial hypertension


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### Indications for pre-LP head CT scan

**Table 2. Recommended criteria for adult patients with suspected bacterial meningitis who should undergo CT prior to lumbar puncture (B-II).**


Criterion	Comment
Immunocompromised state	HIV infection or AIDS, receiving immunosuppressive therapy, or after transplantation
History of CNS disease	Mass lesion, stroke, or focal infection
New onset seizure	Within 1 week of presentation, some authorities would not perform a lumbar puncture on patients with prolonged seizures or would delay lumbar puncture for 30 min in patients with short, convulsive seizures
Papilledema	Presence of venous pulsations suggests absence of increased intracranial pressure
Abnormal level of consciousness	...
Focal neurologic deficit	Including dilated nonreactive pupil, abnormalities of ocular motility, abnormal visual fields, gaze palsy, arm or leg drift

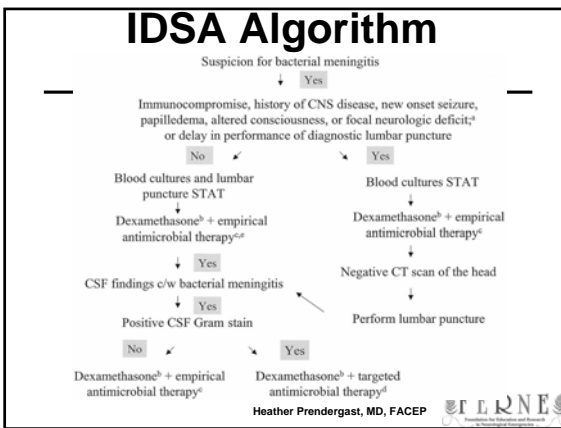
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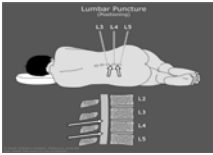
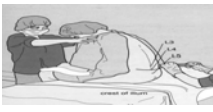
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- ### Contraindications
- **Skin infection near site of LP**
  - **Suspicion of intracranial pressure due to cerebral mass**
  - **Uncorrected coagulopathy**
  - **Acute spinal cord trauma**
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### Technique

- **Lateral Recumbent position**
- **Sitting upright**

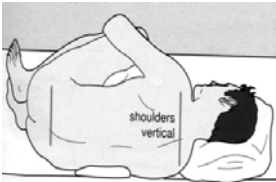
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- ### Procedure
- **Determine correct level of entry**
  - **Highest points of the iliac crests should be identified and palpated**
  - **Direct line joining the crests identifies L4**
  - **Spinous processes L3, L4, and L5 can be directly palpated**
  - **Goal: Subarachnoid space at L3/4 or L4/5**
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### Positioning: Key to Success


- Fetal position with neck, back, and limbs held in flexion
- Lower lumbar spine flexed with back *perfectly* perpendicular to edge of bed
- Hips and legs should be parallel to each other and perpendicular to table



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### Positioning




INCORRECT                      CORRECT

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### Skin Preparation

- Overlying skin cleaned with povidone-iodine
- Sterile drape placed with an opening over the LS

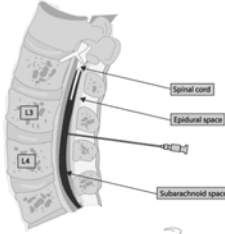


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### Spinal Needle Insertion

- Local anesthesia infiltrated
- 20 or 22 gauge spinal needle with stylet
- Advance spinal needle slowly, angling slightly toward the head
- Flat surface of bevel of needle positioned to face patient's flanks




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### Post-LP Headache

- Etiology: Prolonged leakage of cerebrospinal fluid due to delayed closure of dural defect
  - Low CSF pressure
  - Incidence 1-70%
  - Contributing factors
    - Diameter of needle, shape of needle, diagnostic vs. spinal anesthesia


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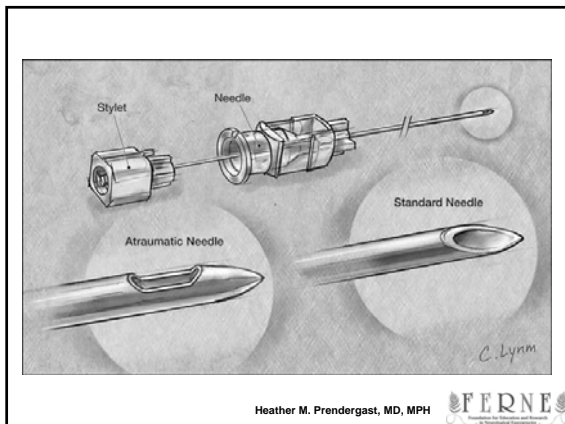
### Minimizing Post-LP Headache

- Techniques:
  - Needle choice
    - Standard Quincke vs. Atraumatic
  - Number of attempts
  - Reinsertion of Stylet
  - Bed Rest after Procedure

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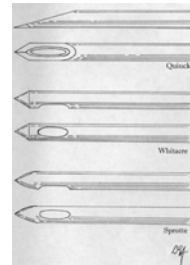


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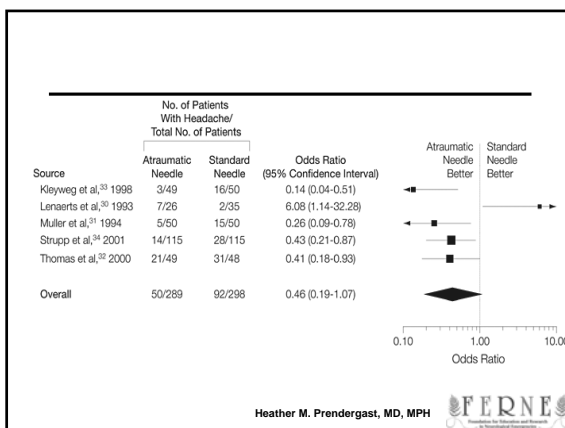


**Post LP Headache**

- **Quincke:**
  - Reduction in post LP headache as great as 50%
- **“Atraumatic”**
  - Post LP headache rates of 2-6%



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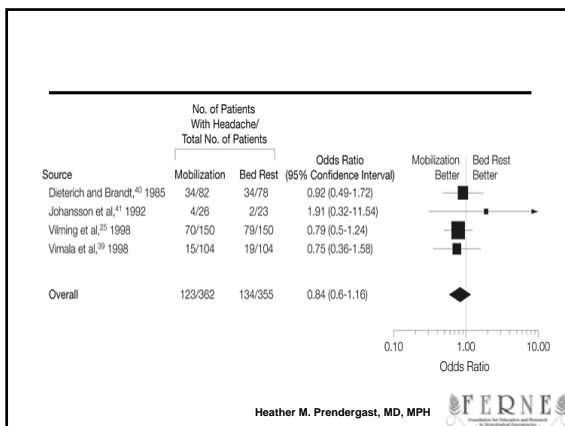
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**Reinsertion of Stylet**

- **600 patients**
  - Post lumbar puncture syndrome
    - 49/300 (16 %) no reinsertion
    - 15/300 ( 5%) reinsertion

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**Measuring Opening Pressure**

- **Once CSF appears attach manometer through stopcock**
- **Note the height of the fluid column**
- **Have patient straighten legs to avoid falsely elevated pressure**



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## **Understanding Opening Pressures**

- **Normal:** 60-200 mm H<sub>2</sub>O (obese patients up to 250mm H<sub>2</sub>O)
- **Elevated:** Suggest increased intracranial pressures (>250 mm H<sub>2</sub>O)
  - Mass lesion (neoplasm, hemorrhage, infection)
  - Overproduction of CSF
  - Defective Outflow Mechanics

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## **Case Resolution**

- Fever, confusion, and Neck stiffness
- Head CT indicated PRIOR to LP
  - Unable to complete full neurological exam
  - Altered mental status
  - Inability to confirm absence of focal neurological deficit

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## **Conclusions**

- ED seizure patient Rx needs to address both the immediate seizure and the long-term epilepsy management
- In general, ED seizure patient Rx focuses on parenteral AED use
- Oral Rx, 2<sup>nd</sup> generation AEDs useful
- Must understand principles that govern ED AED use and priorities of those that provide long-term epilepsy Rx

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## **Recommendations**

- Be able to identify the seizure type and optimal patient therapies based on etiology, demographics, and risk/benefit
- Establish seizure and SE protocol
- Understand fully the optimal use of parenteral and 2<sup>nd</sup> generation AEDs
- Stop the acute seizure & prevent SE
- Wisely prescribe so that follow-up epilepsy management can be optimized

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## **Questions?**

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