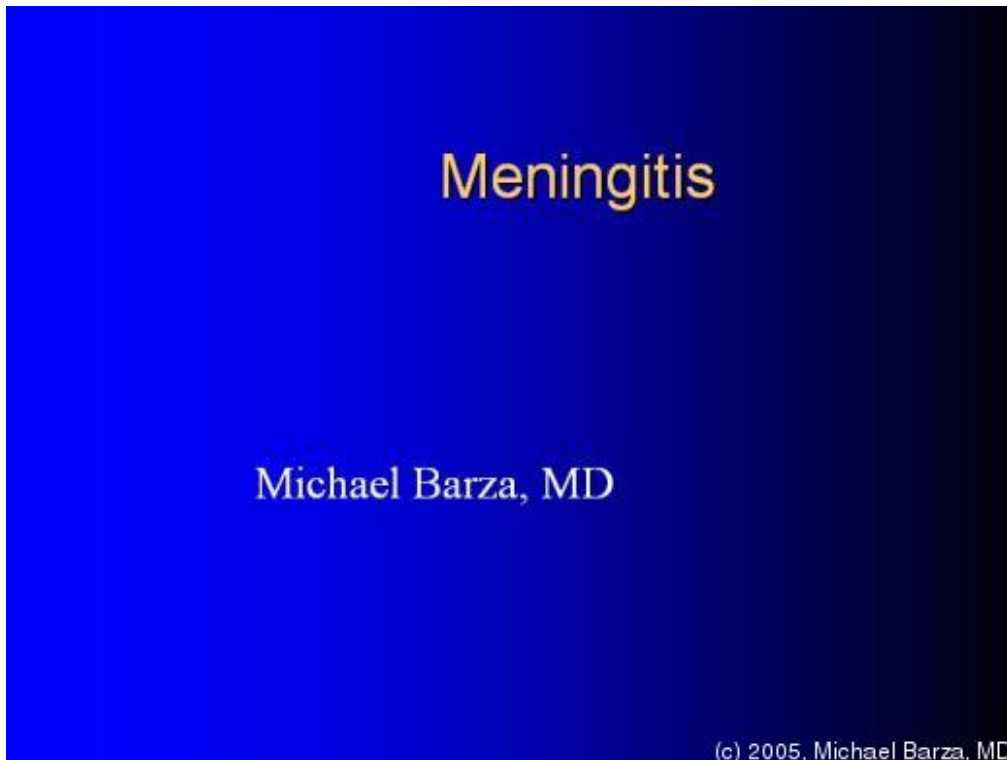


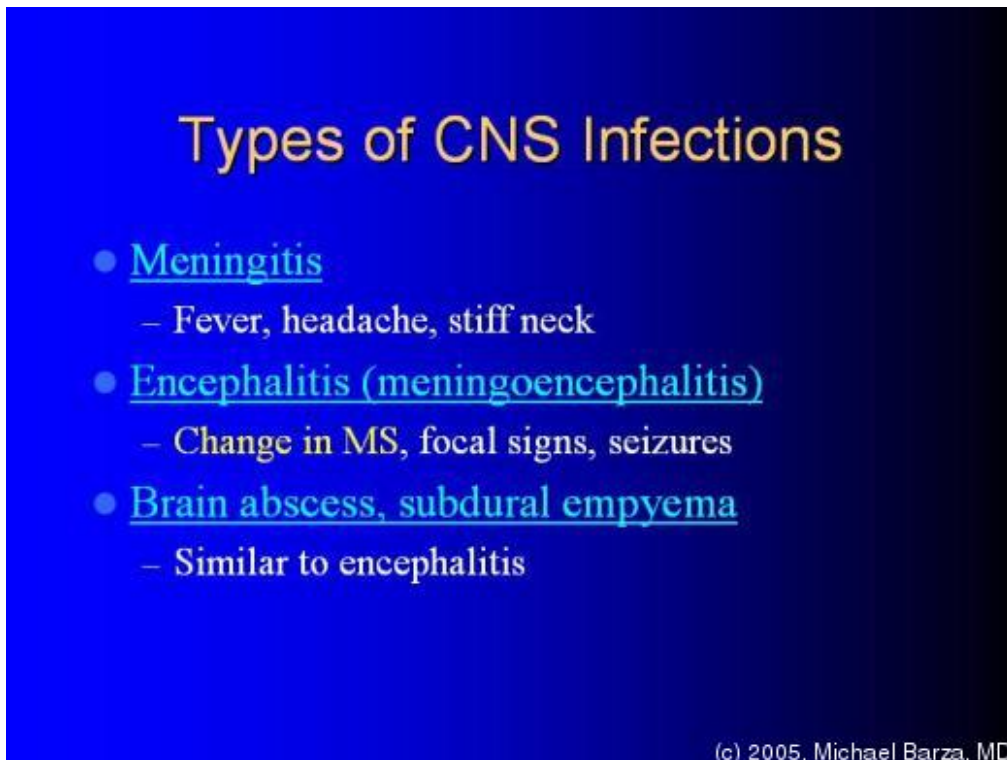
1.

Meningitis



2.

Types of CNS Infections



3. Causes of CNS Infections

Causes of CNS Infections

Syndrome	Usual causes
Meningitis	Bacterial, viral, fungal
Encephalitis	Mainly viral
Brain abscess	Mainly bacterial

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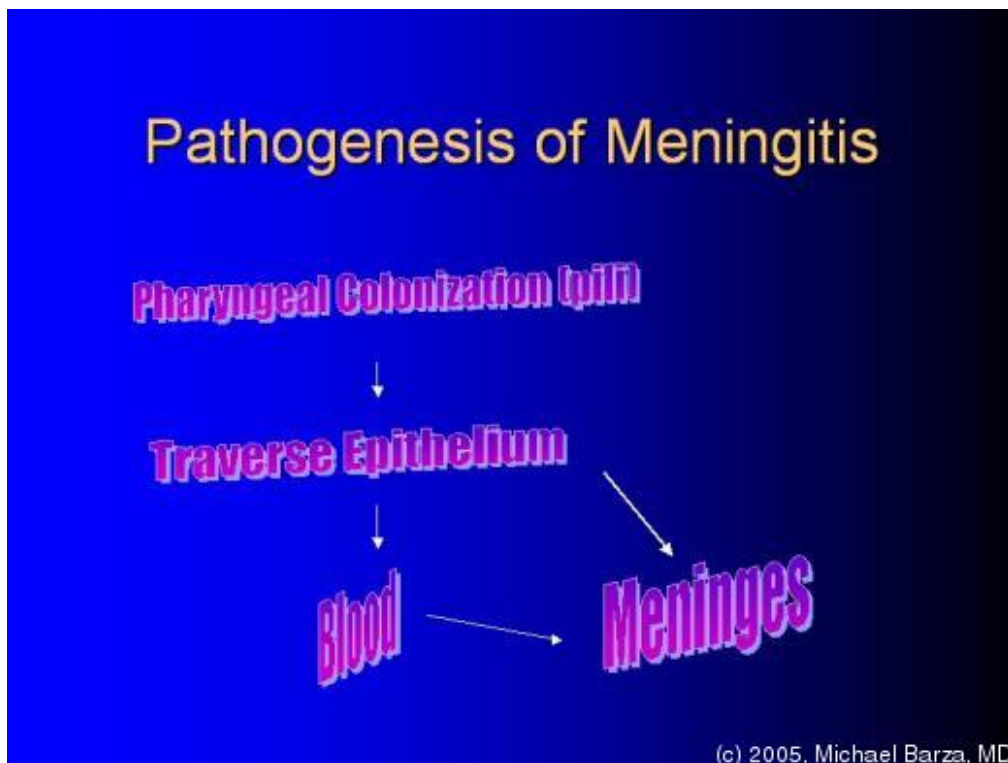
4. Routes of CNS Infection

Routes of CNS Infection

Route	Agent
Hematogenous	Most agents
Contiguous (sinus, ear, face)	Bacteria
Direct inoculation (trauma)	Bacteria
Via nerves	HSV, VZV, rabies

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5. Pathogenesis of Meningitis



6. Encapsulated Organisms

-
- Encapsulated Organisms**
- Streptococcus pneumoniae
 - Hemophilus influenzae b
 - Neisseria meningitidis
 - Cryptococcus neoformans
 - Children: E. coli K1; group B strep
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7. Clinical Features of Meningitis

Clinical Features of Meningitis

- May be URI prodrome
- Headache, fever, stiff neck, photophobia
- Abnormal CSF
- Mortality $\approx 30\%$ for pneumococcal
 - Start treatment promptly

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8. CSF "Profiles" (1)

CSF "Profiles"

Profile	Common Causes
Purulent (PMNs, low glucose) - acute	Bacterial
Lymphocytic low glucose* - subacute	TB, fungal, spirochetal Sarcoidosis; CA
Lymphocytic normal glucose	Viral

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9.

Evolution of Profiles

Evolution of Profiles

- May evolve over hours to days
 - Glucose may take days to fall in lymphocytic low glucose
- Treatment effect
 - Purulent \Rightarrow lymphocytic low glucose \Rightarrow normal glucose
- Repeat LPs to detect direction of change

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10.

Other Features

Other Features

Profile	Onset	Pathology
Purulent	Acute (1-2 d)	Pus over convexities
Lymphocytic low glucose	Subacute	Granulomatous Base of brain Cranial n palsies
Lymphocytic normal glucose	Acute or subacute	Mild inflammation

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11. Risk Groups

Risk Groups

Neonate	Young adult	Older	Immuno-suppressed
E. coli Group B strep Listeria	Meningo Pneumo	Pncumo Meningo	Crypto Listeria

Traumatic: Pneumo, S. aureus, gram-neg

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12. CSF "Profiles"

CSF "Profiles"

Profile	Common Causes
Purulent (PMNs, low glucose)	Bacterial
Lymphocytic low glucose*	TB, fungal, spirochetal Sarcoidosis; CA
Lymphocytic normal glucose	Viral

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13.

Purulent Meningitis - "Big 3"

Purulent Meningitis - "Big 3"

- Clinically, all are "acute"
 - *S. pneumoniae*
 - Most common
 - *N. meningitidis*
 - Usually single cases
 - May be rash
- *H. influenzae* (rare since vaccine)

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14.

Listeria Monocytogenes

Listeria Monocytogenes

- Subacute, lymphocytic/purulent
- Suspect if immunocompromise
 - e.g. lymphoma, cirrhosis, steroids
 - Rare in HIV

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15. Empiric Treatment of Purulent Meningitis

Empiric Treatment of Purulent Meningitis

- Neonate
 - Amp (strep, Listeria) + cefotaxime (E coli)
- Older age
 - Ceftriaxone (2 gm Q12h) or cefotaxime +
 - Vancomycin (up to 2-3 g/d)
 - If immunocompromised, add ampicillin

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16. Steroids in Adults With Bacterial Meningitis

Steroids in Adults With Bacterial Meningitis

- Dexamethasone begun before first dose of antibiotic
 - 36% *S. pneumo*, 33% *N. meningitidis*
- Better neurological outcome
- 50% decrease in mortality

de Gans, NEJM 2002; 347: 1549-56

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17.

CSF "Profiles" (2)

CSF "Profiles"

Profile	Common Causes
Purulent (PMNs, low glucose)	Bacterial
→ Lymphocytic low glucose*	TB, fungal, spirochetal Sarcoidosis; CA
Lymphocytic normal glucose	Viral

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18.

Lymphocytic Low Glucose-Beware!!!

- ### Lymphocytic Low Glucose- Beware!!!
- Usually subacute (over days)
 - Granulomatous reactions base of brain
 - Cranial nerve palsies!!!
 - Require specific treatment but dx difficult
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19. Diagnosis of Lymphocytic Low-Glucose

Diagnosis of Lymphocytic Low-Glucose

- Fungal
 - Culture, serology, PCR; crypto antigen
- Spirochetal
 - Lyme (clinical; serology; PCR)
 - Syphilis (VDRL)
- TB
 - Often by exposure, exclusion of others

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20. CSF "Profiles" (3)

CSF "Profiles"

Profile	Common Causes
Purulent (PMNs, low glucose)	Bacterial
Lymphocytic low glucose*	TB, fungal, spirochetal Sarcoidosis; CA
→ Lymphocytic normal glucose	Viral

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21.

Lymphocytic Normal Glucose

Lymphocytic Normal Glucose

- Usually viral (Coxsackie, ECHO)
- Summertime, children and young adults
- Usually don't need to admit
- West Nile Virus: meningitis, encephalitis, poliovirus like (anterior horn cell)

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22.

Noninfectious Meningitis

Noninfectious Meningitis

- NSAIDs (especially ibuprophen)
 - Purulent
- Trimethoprim-sulfamethoxazole
- IV immune globulin

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23.

Key Points

Key Points

- Meningitis vs. encephalitis (MS changes)
- CSF profiles
 - Purulent: “Big 3” causes
 - Lymph-low glucose (base of brain; cranial n)
Most treatable! Remember TB!
 - Lymph-normal glucose (viral)
- Risk groups (age, immunosuppression)

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24.

Case 1 - Meningitis and Rash

Case 1 - Meningitis and Rash

- 20 yo freshman in college dorm
- 1 day fever, headache, stiff neck, sleepy
- CSF shows
 - 1200 WBC (99% PMNs)
 - Glucose 15 mg/dL (very low)
 - See next slides: gram stain chars?
- Cause? Treatment?

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25.

Case 2

Case 2

- 56 yo woman came from China 3 yrs ago
- One week fever, headache
- Physical: somnolent; mildly stiff neck
- CSF shows
 - 300 cells, mainly lymphs
 - Glucose 45 mg/dL; protein high
- You suspect...

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26.

Case 2 (cont'd)

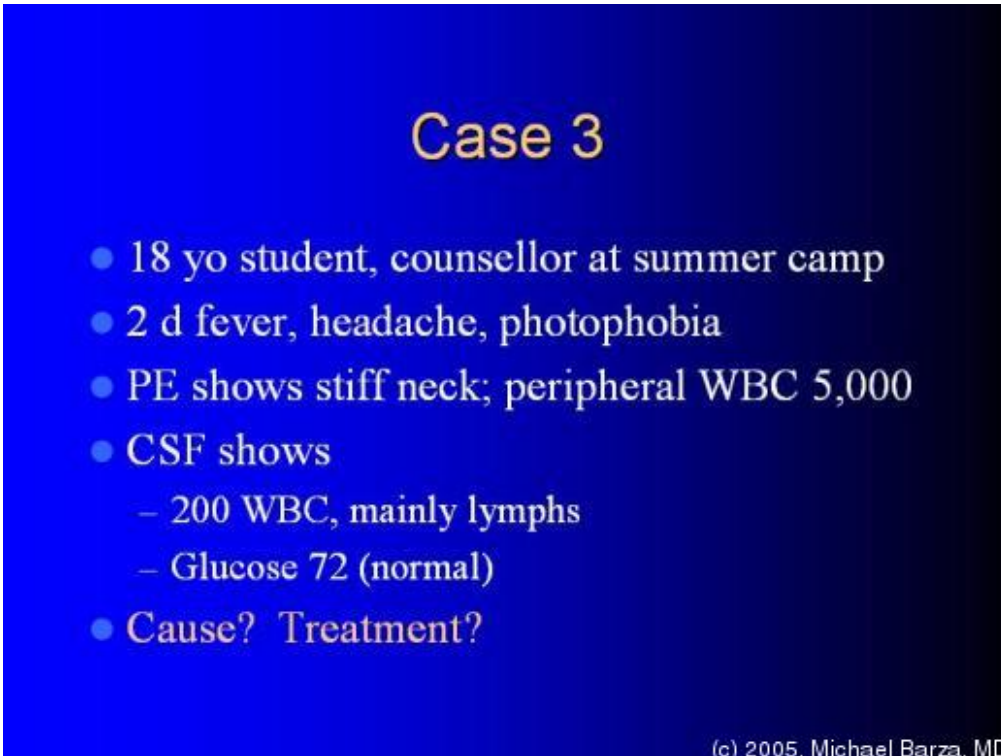
Case 2 (cont'd)

- Two days later, L facial palsy develops
- CSF shows
 - 400 cells, mainly lymphs (was 300)
 - Glucose 30 mg/dL (was 45)
- Dx? Tests?

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27.

Case 3



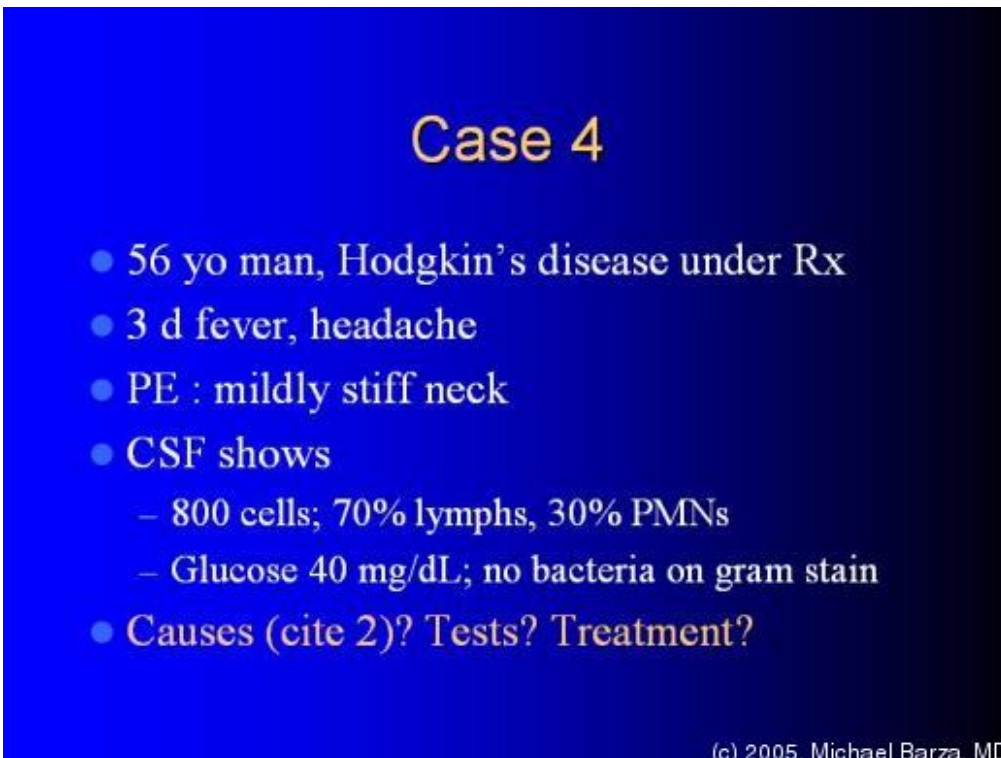
Case 3

- 18 yo student, counsellor at summer camp
- 2 d fever, headache, photophobia
- PE shows stiff neck; peripheral WBC 5,000
- CSF shows
 - 200 WBC, mainly lymphs
 - Glucose 72 (normal)
- Cause? Treatment?

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28.

Case 4



Case 4

- 56 yo man, Hodgkin's disease under Rx
- 3 d fever, headache
- PE : mildly stiff neck
- CSF shows
 - 800 cells; 70% lymphs, 30% PMNs
 - Glucose 40 mg/dL; no bacteria on gram stain
- Causes (cite 2)? Tests? Treatment?

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