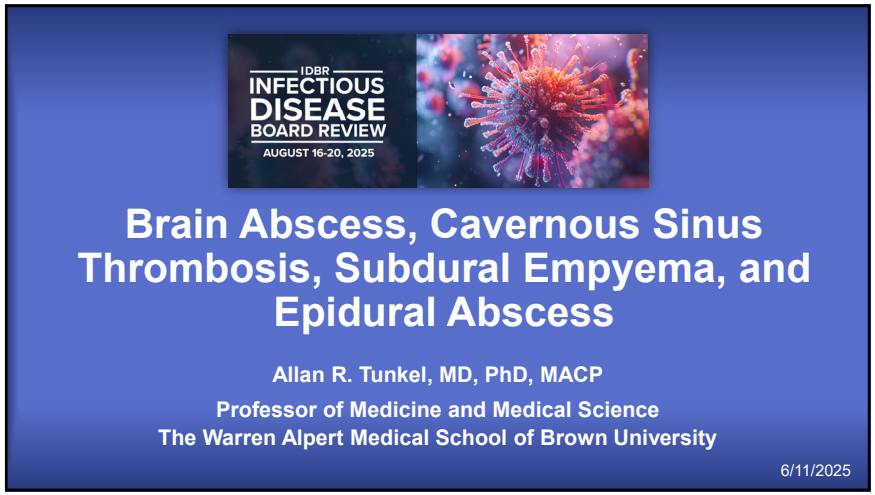

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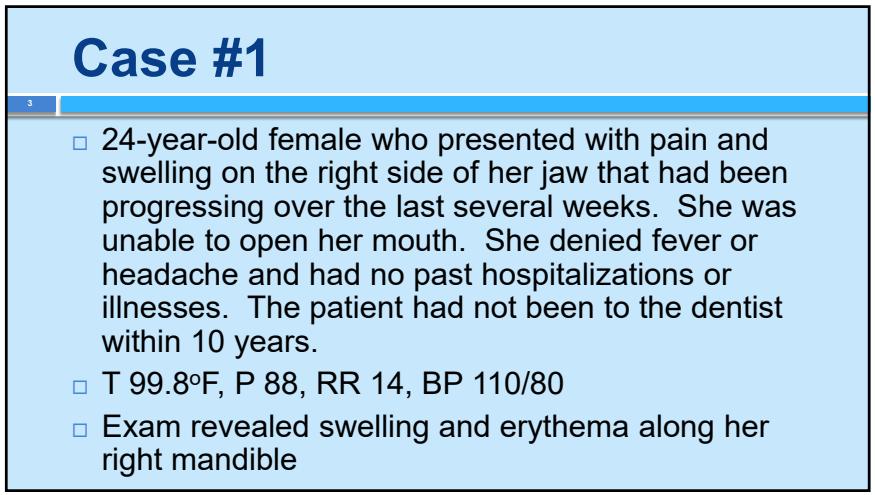

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Question #1

Which of the following empiric antimicrobial regimens should be initiated?

A. Ceftriaxone + metronidazole
B. Vancomycin + cefepime
C. Trimethoprim-sulfamethoxazole
D. Voriconazole
E. Liposomal amphotericin B

6

Question #1

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A. **Ceftriaxone + metronidazole ***
B. Vancomycin + cefepime
C. Trimethoprim-sulfamethoxazole
D. Voriconazole
E. Liposomal amphotericin B

7

Predisposing Conditions for Brain Abscess

Condition	Relative Frequency (%)
Contiguous focus of infection (otitis media, mastoiditis, sinusitis, face or scalp infection, dental sepsis, osteomyelitis, penetrating head injury)	30-50
Hematogenous spread (lung abscess, empyema, congenital heart disease, bronchiectasis, infective endocarditis, compromised host, hereditary hemorrhagic telangiectasia)	~35
Cryptogenic	10-35

8

Principles of Brain Abscess Management

- MR imaging is the diagnostic procedure of choice; diffusion-weighted imaging increases diagnostic accuracy (sensitivity and specificity 96% for differentiation from cancers [PPV 98%; NPV 92%])
- Lumbar puncture is contraindicated
- Biopsy or aspiration (via stereotactic guidance) is needed for microbiologic diagnosis
- Begin empiric antimicrobial therapy based on underlying condition and pathogenesis of spread of infection to brain

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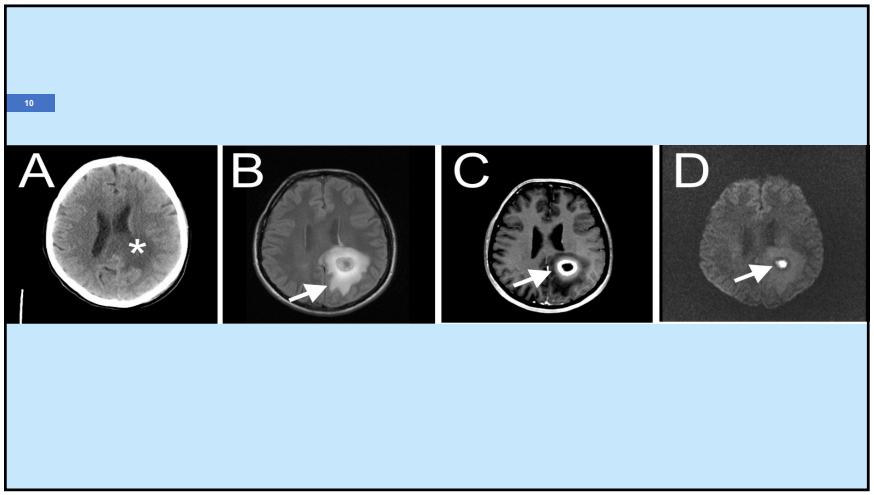

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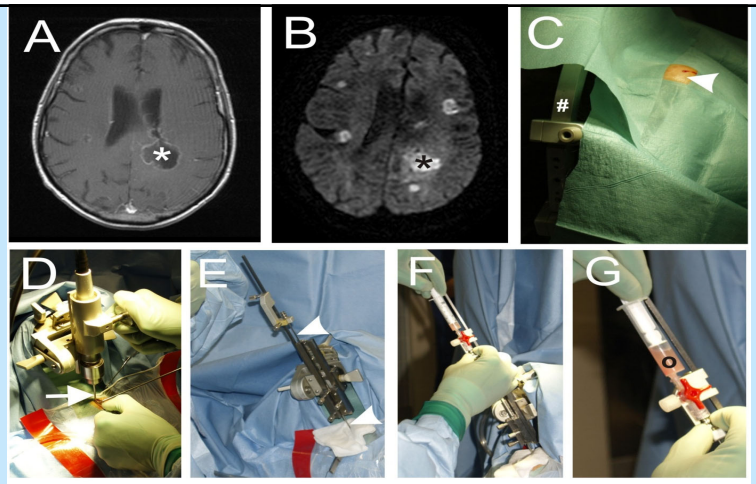

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Empiric Antimicrobial Therapy of Brain Abscess

Predisposing Condition	Antimicrobial Regimen
Otitis media or mastoiditis	Metronidazole + a third-generation cephalosporin[a]
Sinusitis	Vancomycin + metronidazole + a third-generation cephalosporin[a]
Dental sepsis	Third-generation cephalosporin[a] + metronidazole
Penetrating trauma or post-neurosurgical	Vancomycin + a third- or fourth-generation cephalosporin
Lung abscess, empyema, bronchiectasis	Vancomycin + metronidazole + a third- or fourth-generation cephalosporin + trimethoprim-sulfamethoxazole[b]
Bacterial endocarditis	Vancomycin[c]

[a]ceftriaxone or cefotaxime
[b]add if *Nocardia* suspected, along with 1-2 additional agents
[c]additional agents may be used based on other likely microbial etiologies

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Empiric Antimicrobial Therapy of Brain Abscess

13

Predisposing Condition	Antimicrobial Regimen
Unknown	Vancomycin + metronidazole + a third or fourth generation cephalosporin; or vancomycin + meropenem
Transplant recipients	Add voriconazole + trimethoprim-sulfamethoxazole (plus additional 1-2 anti-nocardial agents) if *Nocardia* suspected
HIV-infected patients	Add pyrimethamine + sulfadiazine; consider isoniazid, rifampin, pyrazinamide, and ethambutol for possible tuberculosis

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Case #2

14

- 21-year-old member of a motorcycle gang thrown from his bike, and suffered a depressed skull fracture
- In the OR, a large subdural hematoma was evacuated
- Discharged in 5 days
- Returned by mother 5 days later because of bizarre behavior
- No headache, afebrile

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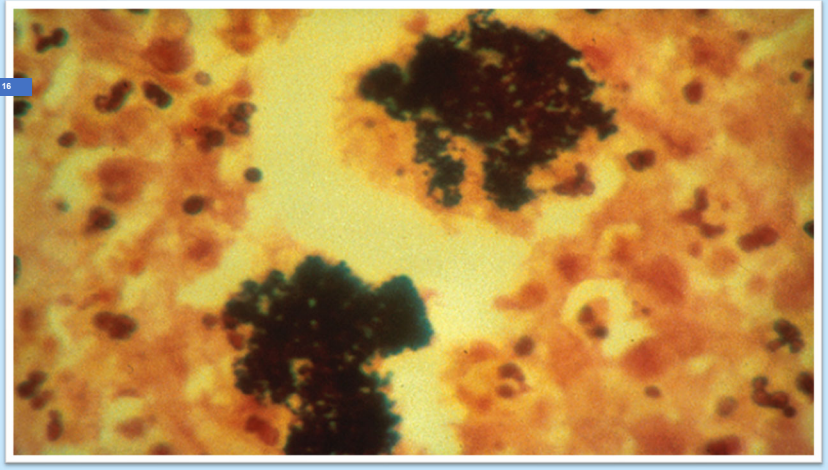

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Case #3

17

- 78-year-old male with multiple myeloma on chronic prednisone therapy; underwent aortic valve replacement with a bioprosthesis 5 years earlier; presented with new-onset seizures
- T 100.4º F, P 96, RR 18, BP 110/70 mmHg; Exam (-)
- CT scan revealed multiple ring-enhancing lesions
- TEE - no vegetations and normal bioprosthesis
- Empirically placed on vancomycin + ampicillin + gentamicin
- Blood cultures negative

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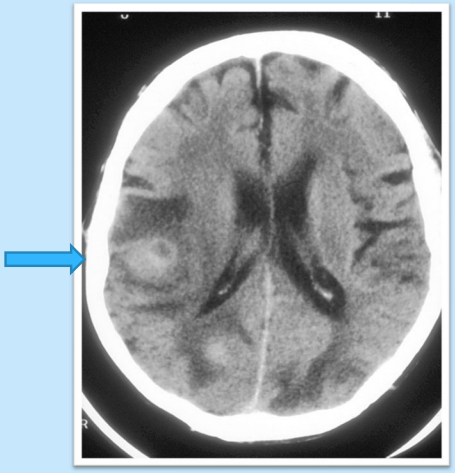

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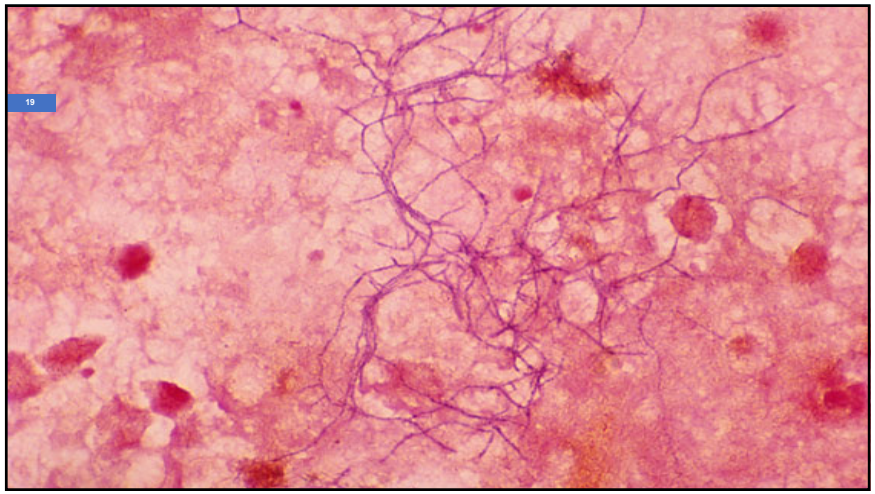

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Question #2 (Case #3)

20

Which of the following antimicrobial regimens should be initiated?

A. Penicillin + metronidazole
B. Trimethoprim-sulfamethoxazole + imipenem
C. Daptomycin + cefepime
D. Liposomal amphotericin B + 5-FC
E. Voriconazole

20

Question #2 (Case #3)

21

Which of the following antimicrobial regimens should be initiated?

A. Penicillin + metronidazole
B. **Trimethoprim-sulfamethoxazole + imipenem ***
C. Daptomycin + cefepime
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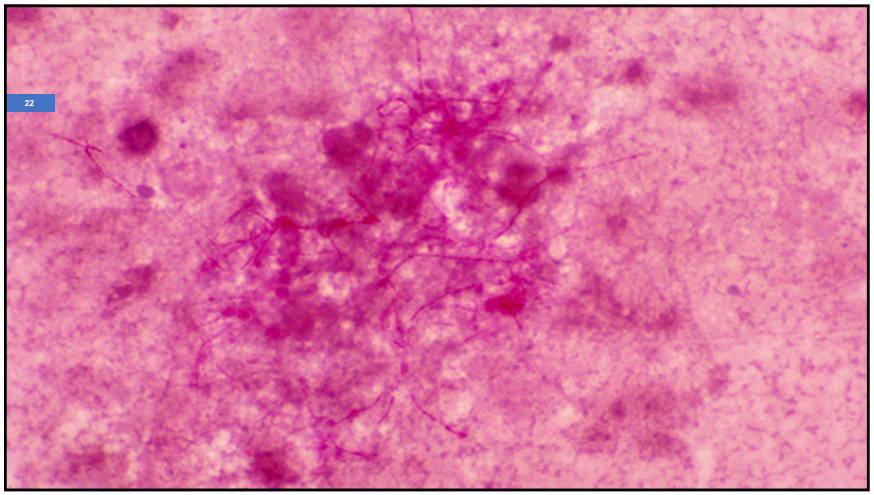

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Case #4

23

- 24-year-old injection drug user who, while injecting intravenous drugs with his girlfriend, fell out of the second story window of his apartment. When he did not return for 48 hours, she found him unresponsive on the ground and called fire rescue
- T 103°F, P 150, RR 32, BP 110/76 mmHg
- On exam, he was comatose without evidence of head trauma
- WBC 13,000/mm^3, profound metabolic acidosis

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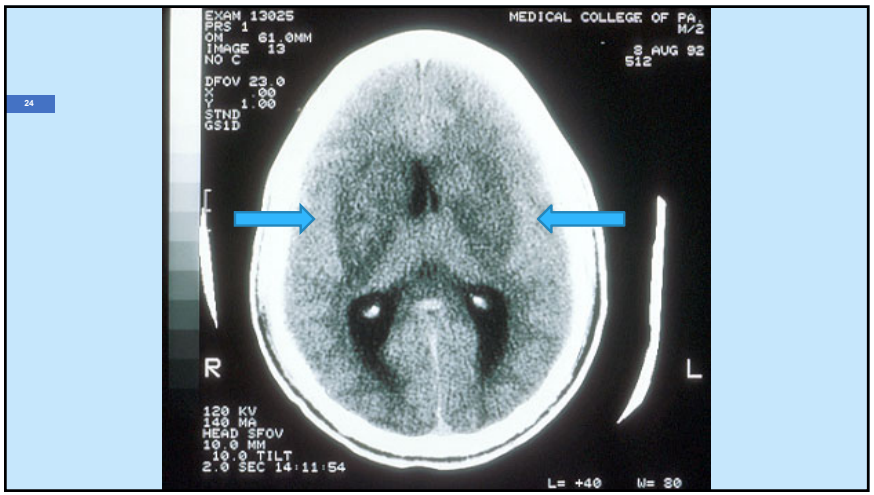

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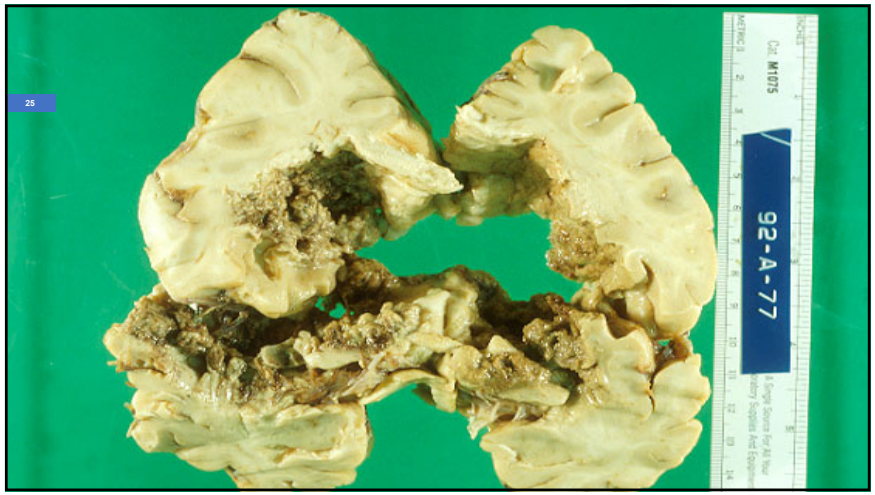

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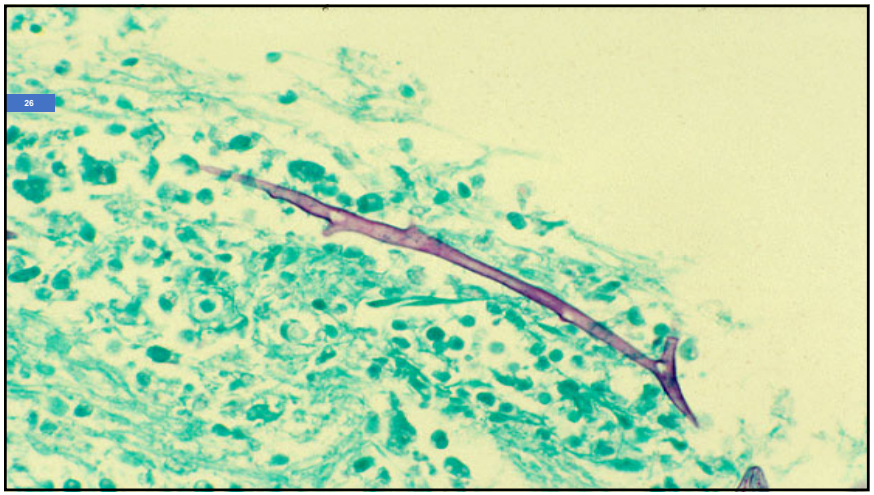

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Case #5

27

- 11-year-old boy with chronic granulomatous disease on chronic TMP-SMX therapy noted the onset of a mild headache which lasted 10 minutes.
- Two weeks later at a routine physician visit, the patient had no complaints and denied recurrence of the headache
- On examination, the patient had normal vital signs and a normal neurologic examination
- The physician ordered an MR imaging of the head

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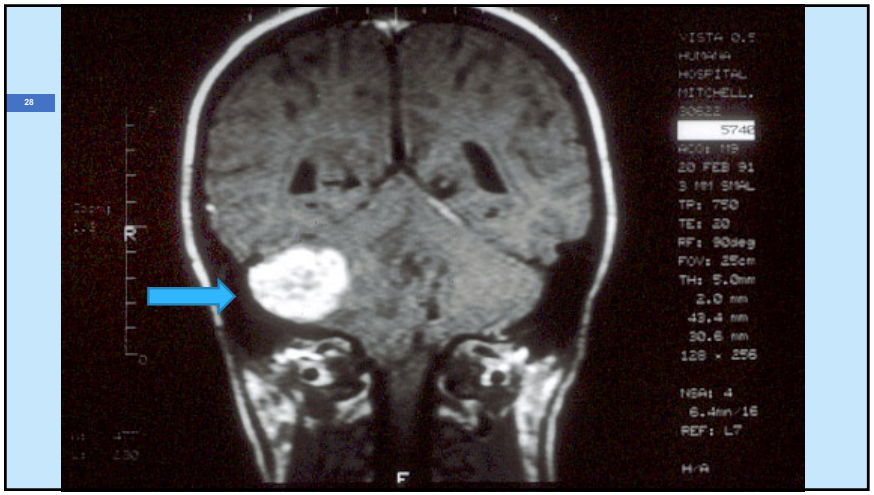

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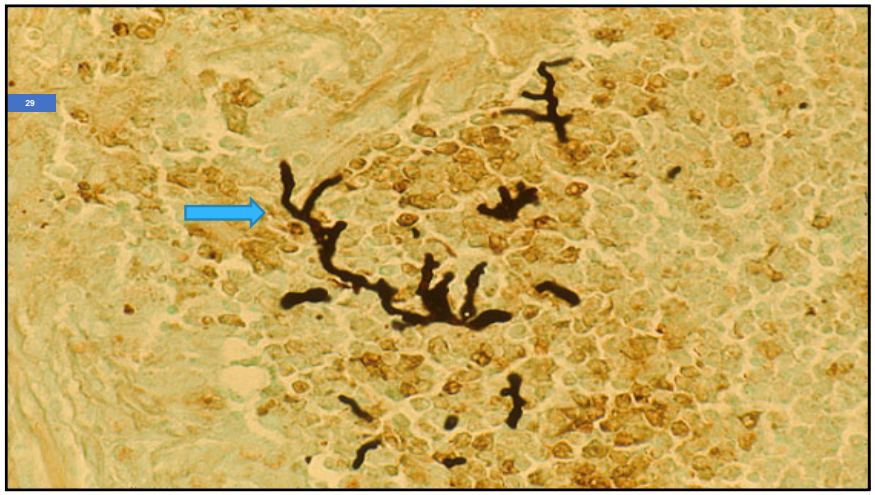

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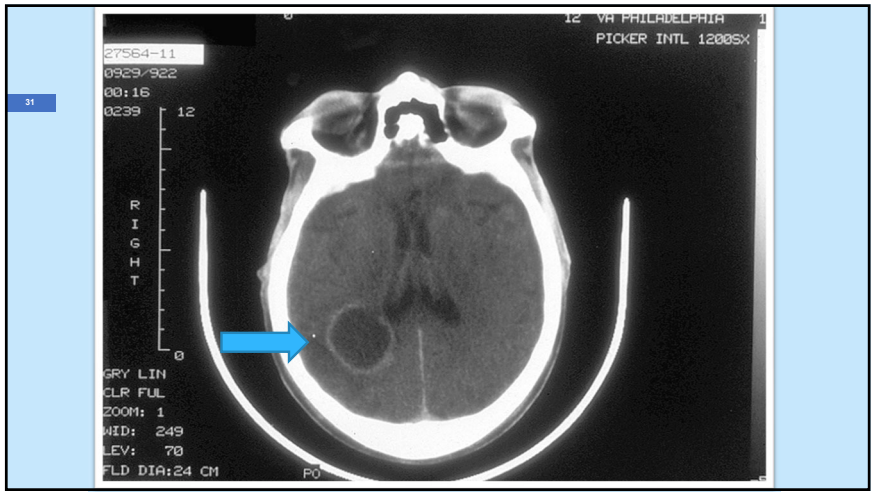
Case #6

30

- 80-year-old male with CLL on chronic prednisone therapy presented to the VA Hospital with sepsis and ARDS. Course complicated by VDRF and multiple nosocomial infections, including candidemia for which he received 4 weeks of IV liposomal amphotericin B. After completing the course of therapy, he developed altered mental status
- T 101^0 F, P 100, RR 20, BP 120/76
- Neurologic exam left-sided hyperreflexia and Babinski



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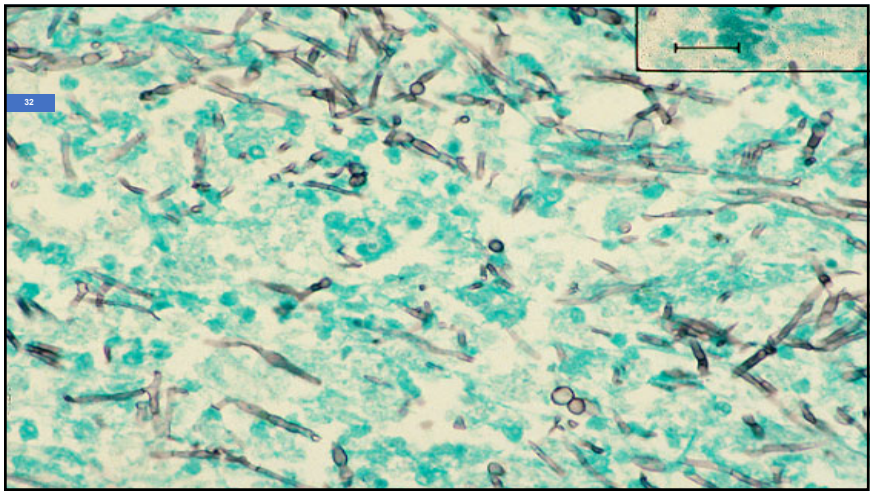

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Principles of Brain Abscess Management

33

- Optimal management usually requires a combined medical and surgical approach (aspirate if >2.5 cm)
- Fungal brain abscess often requires combined medical and surgical therapy
- Initiate corticosteroids with evidence of cerebral edema or mass effect causing increased ICP

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Antimicrobial Therapy of Brain Abscess

34

Organism	Antimicrobial Therapy
Actinomyces sp.[a]	Penicillin G
Bacteroides fragilis[a]	Metronidazole
Enterobacterales[a]	Third- or fourth-generation cephalosporin, or another agent based on in vitro susceptibility
Fusobacterium sp.[a]	Metronidazole
Pseudomonas aeruginosa	Ceftazidime or cefepime or meropenem
Staphylococcus aureus	Nafcillin, oxacillin, or vancomycin
Strep. milleri;[a] other streptococci[a]	Penicillin G

[a]depending on pathogenesis of infection, may be isolated as part of a mixed infection

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Antimicrobial Therapy of Brain Abscess

35

Organism	Antimicrobial Therapy
Nocardia asteroides	Trimethoprim-sulfamethoxazole + imipenem; add third drug in those with severe disease, or those failing standard therapy
Mycobacterium tuberculosis	Isoniazid + rifampin + pyrazinamide ± ethambutol

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Antimicrobial Therapy of Brain Abscess

36

Organism	Antimicrobial Therapy
Aspergillus sp.	Voriconazole
Candida sp.	Lipid formulation of amphotericin B[a]
Mucorales	Lipid formulation of amphotericin B
Scedosporium spp.	Voriconazole

[a]Addition of 5-flucytosine should be considered

36

Case #7

37

- 79-year-old female is transferred from a nursing home for failure to thrive as a result of decreased oral intake. A nasogastric tube is placed via the left nares for enteral hyperalimentation
- One week into her hospital course, the patient develops fever to 101.5° F, and left periorbital edema and chemosis
- CT scan of the head without contrast reveals opacification of the sphenoid sinus

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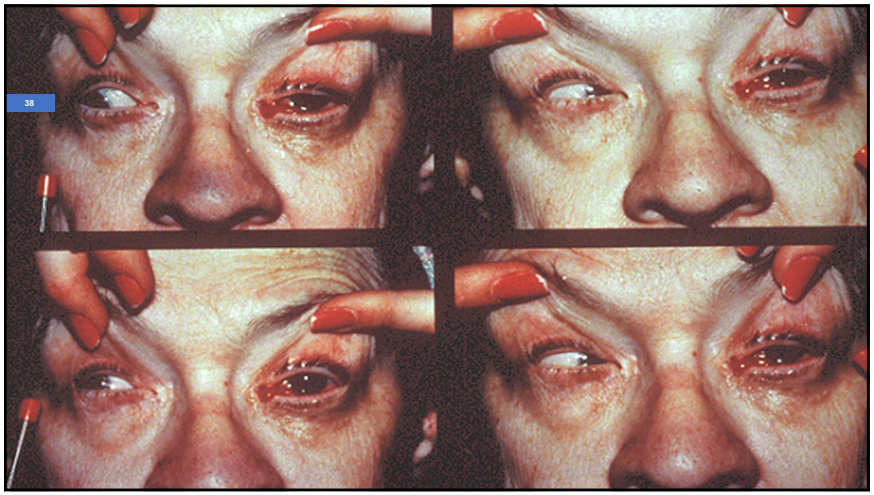

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Question #3 (Case #7)

39

Which of the following studies should be performed to establish the diagnosis?

A. CT scan of the head and sinuses with contrast
B. MR imaging with MR venography
C. Cerebral angiography
D. Positron emission tomography of the head
E. Lumbar puncture

39

Question #3 (Case #7)

40

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A. CT scan of the head and sinuses with contrast
B. **MR imaging with MR venography ***
C. Cerebral angiography
D. Positron emission tomography of the head
E. Lumbar puncture

40

Epidemiology and Etiology of Septic Cavernous Sinus Thrombosis

41

Risk Factors	Etiologic Agents
Paranasal sinusitis	Staphylococci (60-70%)
Facial infection	Streptococci (~17%)
Dental infection	Gram-negative bacilli (~5%)
	Pneumococci (~5%)
	Bacteroides sp. (~2%)

41

Clinical Features of Septic Cavernous Sinus Thrombosis

42

Symptoms	Signs
Headache (52%)	Periorbital edema (73%)
Facial pain	Chemosis
Vision loss	Papillitis
Fever	Oculomotor palsies
Double vision	Proptosis

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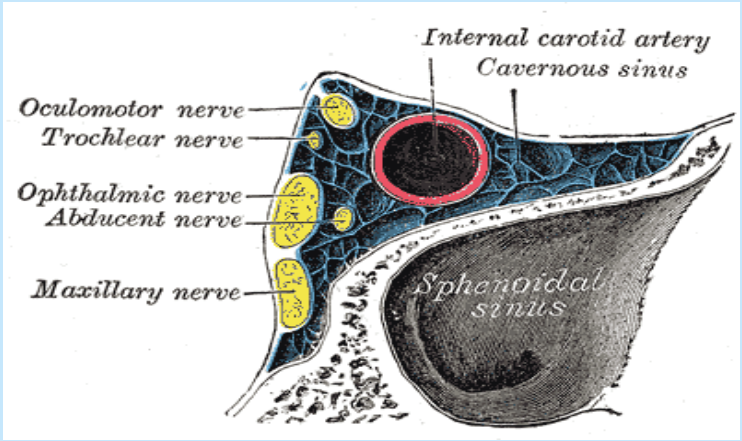

Tunkel AR. Principles and Practice of Infectious Diseases, 8th ed. 2015.

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Radiologic Findings lin Septic Cavernous Sinus Thrombosis

44

MR imaging

- Noninvasive diagnostic procedure of choice
- MRA and MRV can directly visualize cerebral vasculature
- Fullness in cavernous sinus region
- Paranasal sinus fluid

44

45

Management of Septic Cavernous Sinus Thrombosis

- Culture and drainage of infected sinuses
- Antimicrobial therapy (vancomycin + metronidazole + 3rd or 4th generation cephalosporin)
- Anticoagulation - Yes
- Corticosteroids - No

46

Case #8

- 22-year-old man with a history of paranasal sinusitis presents with fever, severe headache, neck pain, and seizure
- On physical examination, T 102º F and he is lethargic
- Laboratory studies normal

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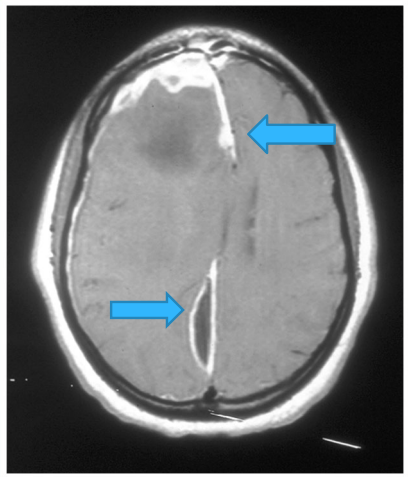

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Question #4 (Case #8)

49

In addition to appropriate antimicrobial therapy, what other management should be performed?

A. Lumbar puncture
B. External ventricular drain
C. Dexamethasone
D. Burr hole drainage
E. Craniotomy

49

Question #4 (Case #8)

50

In addition to appropriate antimicrobial therapy, what other management should be performed?

A. Lumbar puncture
B. External ventricular drain
C. Dexamethasone
D. Burr hole drainage
E. **Craniotomy ***

50

Cranial Subdural Empyema and Cranial Epidural Abscess

51

Risk Factors	Etiologic Agents
Sinusitis (50-80%)	Staphylococci (10-15%)
Otogenic	Streptococci (25-45%)
Head trauma	Gram-negative bacilli (3-10%)
Neurosurgery	Other anaerobes (8%)
Hematogenous	Others (8%)
Meningitis	Unknown (20%)

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Cranial Subdural Empyema and Cranial Epidural Abscess

52

Subdural Empyema
(acute course)

- Fever
- Headache
- Depressed consciousness
- Hemiparesis
- Seizures
- Nuchal rigidity
- Gaze palsies/ataxia

Epidural Abscess
(indolent course)

- Headache
- Fever
- Seizures
- Focal neurologic signs
- Altered mental state

52

Principles of Management of Cranial Subdural Empyema

53

- MR imaging (diagnostic procedure of choice) provides better clarity of detail and can differentiate empyema from most sterile effusions and chronic hematomas; diffusion-weighted imaging adds to value of MRI
- Surgical therapy (burr holes or craniotomy) is imperative; better outcome with craniotomy
- Empiric antimicrobial therapy based on pathogenesis of infection

53

Surgical Management of Cranial Subdural Empyema

54

Surgical Procedure	Mortality Rate
Burr hole(s)	23.3%
Craniectomy	11.5%
Craniotomy	8.4%

Nathoo et al. Neurosurgery 2001;49:872

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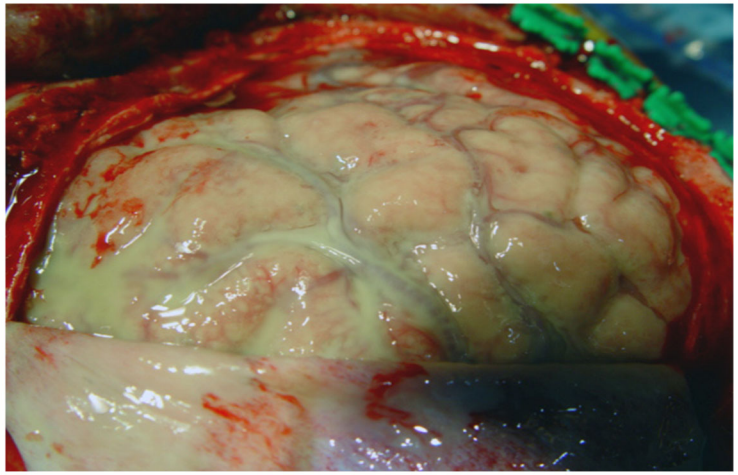

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Epidemiology of Spinal Epidural Abscess

56

- Usually occurs secondary to hematogenous dissemination (~50% of cases)
- Contiguous foci (~1/3rd of cases)
- Unidentified source (20-40% of cases)
- Diabetes mellitus identified in up to 50% of patients

56

Etiology of Spinal Epidural Abscess

57

Organism	Relative Frequency (%)
Staphylococci	50-90
Streptococci	8-17
Gram-negative bacilli	12-17
Other anaerobes	2
Other	2
> 1 organism	5-10
Unknown	6

57

Clinical Stages of Spinal Epidural Abscess

58

I. Back pain and tenderness at the level of infection
II. Radicular pain and paresthesias
III. Impaired spinal cord function; motor paresis and sensory deficits
IV. Complete paralysis

58

Principles of Management of Spinal Epidural Abscess

59

- MR imaging is the diagnostic procedure of choice; can visualize the spinal cord and epidural space, and can identify accompanying osteomyelitis, intramedullary spinal cord lesions, and joint space infection
- Empiric antimicrobial therapy should include an antistaphylococcal agent (i.e., vancomycin) and coverage for gram-negative bacilli

59

Principles of Management of Spinal Epidural Abscess

60

- Surgical therapy imperative in the presence of neurologic dysfunction (best if <24-36 hours of complete paralysis)
- Nonsurgical therapy only for patients with an unacceptably high surgical risk or no neurologic deficits at diagnosis; patient must be followed carefully for clinical deterioration

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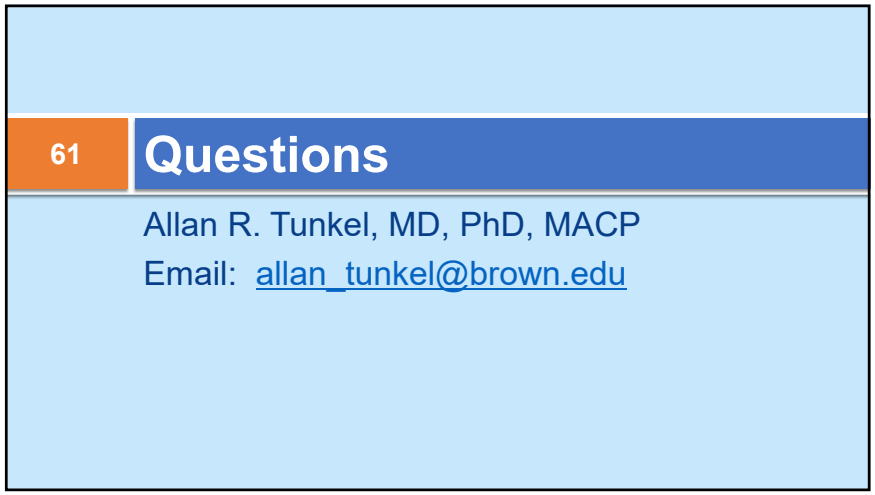

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