

Pharmacy 407
Meningitis
Case Studies
 December 2, 2011

Goal

To prepare you to identify, resolve and prevent drug related problems in patients with meningitis of varying etiology.

Learning Objectives

1. To learn about the pathophysiology of meningitis.
2. To learn about the appropriate diagnosis of meningitis.
3. To learn about the appropriate pharmacotherapy of meningitis in differing populations (neonates, children, young healthy adults, elderly with co-morbidities).
4. To learn about the impact of antibiotic resistance in the treatment of meningitis.
5. To become familiar with the current guidelines and references for the treatment of meningitis .

Recommended Reading

1. Practice Guidelines for the Management of Bacterial Meningitis. Allan R. Tunkel et al CID 2004;39:1267-84.
2. Therapy of suspected bacteria meningitis in Canadian children six weeks of age and older. Canadian Paediatric Society Statement
<http://www.cps.ca/english/statements/ID/id07-03.htm>
3. Central Nervous System Infection - Chapter from Pharmacotherapy a Pathophysiologic Approach - DiPiro et al. (a good source for information about the pathophysiology of meningitis and the need for prophylaxis in various types of meningitis)
4. Dexamethasone in Adults with Community – Acquired Bacterial Meningitis. Deirderik vande Beek and Jan de Gans: Drugs 2006: 66 (4) : 415 – 427
5. Corticosteroids for Acute Bacterial Meningitis, Brian M. Greenwood; NEJM, vol 357 No 24 2507-2509. December 13, 2007

 Meningococcal Vaccines in Canada: an Update;
<http://www.cps.ca/English/statements/ID/ID11-04.htm>
6. Bugs and Drugs 2006

Optional Reading

1. Corticosteroids for acute bacterial meningitis. [Systematic Review] Cochrane van de Beek, Diederik. de Gans, Jan. McIntyre, Peter. Prasad, Kameshwar. Acute Respiratory Infections Group Cochrane Database of Systematic Reviews. 4, 2008.
2. Dexamethasone in Adults with Bacterial Meningitis. Jan De Gans et al; NEJM Vol 347 No 20 Nov 14 2002
3. Corticosteroids for Everyone with Meningitis? –Editorial NEJM vol 347 No 20 Nov 14 2002
4. Adjunctive dexamethasone treatment in acute bacterial meningitis. A. Chaudhuri. Lancet Neurol 2004; 54-62
5. Antimicrobial and Antiinflammatory Treatment of Bacterial Meningitis. Xavier Saez-Llorens, George H. McCracken Jr. Infectious Disease Clinics of North America Vol 13. No. 3. September 1999. Pg. 619-632.
6. Dexamethasone therapy for bacterial meningitis - better never than late? S. King et al. Can J. Infect Dis Vol 5 No 5 Sept/Oct 1994.
7. The Shifting Sands of Meningococcal Disease. S. Shafran, John Conly. Canadian Journal of Infectious Diseases. Vol 10, No 2, March/ April 1999.

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Case #1

J.D. is an 8 year old 70 lb. boy who was brought in to the emergency department by his parents in the evening. He has a 24 hour history of headache, fever, and vomiting. He has been quite lethargic since the afternoon. He has a 4 year old sister at home who has been fine.

On physical exam, his temperature was 40.2°C, HR 140 BPM, BP 80/50, RR 50 and a positive Brudzinski sign was elicited. Meningitis was suspected and a lumbar puncture was performed. CSF was sent for a gram stain, cell count, protein and glucose content and culture and sensitivity and blood chemistry.

- 1. Which signs and symptoms on physical examination are consistent with meningitis?**

- 2. What are the most likely pathogens in this case?**

- 3. Empiric therapy is to be initiated. Which issues are involved in the determination of empiric antimicrobial therapy of meningitis in a child this age?**

- 4. Empiric therapy is to be started immediately. Which agents would be appropriate for use, which of these would you suggest and why?**

5. Results of the CSF findings were as follows:

	Patient	Normal	Bacterial Meningitis
Leukocytes	1500 x 10 ⁶ /L	N (0-5 x 10 ⁶ /L)	> 1000 x 10 ⁶ /L
Neutrophils	85%	N rare	> 75% neutrophils
Protein	0.6 g/L	N (0.15-0.45 g/L)	>0.45 g/L
Glucose	1 mmol/L	N (>2.5 mmol/L or 50% serum glucose)	< 2.5 mmol/L or < 50-50% of serum levels
Serum glucose	5.2 mmol/L		

A gram stain of the CSF showed gram positive diplococci.

How are these findings consistent with the diagnosis? Do these results require a change in therapy?

6. Results from the culture and sensitivity of the CSF come back as

S. pneumoniae

Sensitive: Ampicillin, Cefotaxime, Ceftriaxone, Cefuroxime, Chloramphenicol, Penicillin

Would you make any suggestions based on these results?

7. How long should therapy be continued?

8. What is the mortality rate with this kind of meningitis?

9. What types of complications may occur in these patients?

10. The intern on the service states that he has read about the controversy of dexamethasone being used in patients with meningitis and wonders what the rationale is for this treatment and what the current recommendations are.

11. After three days of therapy the patient's temperature is normal, serum WBC is normal, there is no more vomiting, and he has been able to food down. The intravenous antibiotics are discontinued and an order for amoxicillin suspension 1 g p.o tid is ordered. Is this appropriate for this patient?

12. What is the risk of spread of *S. pneumoniae* among contacts of this case? Is there anything that can be done to prevent the spread of *S. pneumoniae* to contacts of this case?

13. Is there a vaccine that can be used to prevent this type of infection?

Case #2

K.S. is a 22 year old man 5'10" weighing 165 lb. He presents to the emergency department with a history of fever, severe headache, photophobia, and a stiff neck since noon. His girlfriend has brought him in and states that he has been acting very unusual and has been uncharacteristically aggressive this afternoon.

On examination it is found that his temperature is 40°C, HR 120 BPM, BP 95/75, and RR 22/min. Some petechiae are noted on his hands and feet. He has marked nuchal rigidity and a positive Kernig's and Brudzinski signs. He has no signs of papilledema.

Meningitis is suspected and lumbar puncture is performed and samples of C.S.F. are sent to the lab for a gram stain, cell count, protein and glucose content. Blood samples for culture and sensitivity and blood chemistry are drawn.

1. Which signs and symptoms are consistent with the diagnosis of meningitis?
2. What are the most likely pathogens in this case?
3. Empiric therapy is to be started immediately. Which agents would be appropriate for use in this patient and which one would you choose?
4. Results of the CSF studies are as follows:

Leukocytes 1300 x 10⁶/L (95% PMNs)
 Protein 0.7 g/L
 Glucose 1.5 mmol/L
 Serum glucose 6.2 mmol/L

The gram stain showed 2+ gram negative cocci and 4+ PMNs.

How are these consistent with the diagnosis? Do these results require a change from the chosen empiric therapy?

5. Results from the culture and sensitivity come back as

N. meningitidis group C

Sensitive: Penicillin, Ampicillin, Cefotaxime, Ceftriaxone, Chloramphenicol

Would you make any changes to the original empiric therapy based on these results?

6. How long should therapy be continued?

7. What is the mortality rate with this type of meningitis?
8. What types of complications may occur in these patients?
9. Would dexamethasone be useful in this case?
10. What types of prophylactic measures should be taken in this case?
11. If the gram stain done on the CSF had come back showing gram positive diplococci, how would that change the treatment for this patient?

Case 3

K.R. is a newborn baby born 18 hours previously. The baby seemed quite lethargic and was feeding poorly with a reduced sucking response. The baby was slightly tachypneic, the heart rate was slightly increased and the baby's temperature was 36.5°C and the frontal fontanel was bulging slightly. The pediatrician was concerned that the baby may have meningitis and ordered a lumbar puncture.

- 1. Which signs and symptoms are consistent with meningitis in this baby.**
- 2. What are the most likely pathogens in this case?**
- 3. Empiric therapy is to be started immediately. Which agents would be appropriate for use in this patient by which route?**
- 4. Results from the culture and sensitivity come back as**

Group B Streptococci

Sensitive: Penicillin, Ampicillin, Cefotaxime, Ceftriaxone, Chloramphenicol

Would you make any changes to the original empiric therapy based on these results?
- 5. How long should therapy be continued?**
- 6. Would it be appropriate to use dexamethasone in this case?**

Case #4

R.P. is a 59 year old man who presents to the Emergency department. He was found out on the street very disoriented and confused and was brought into the Emergency Department by the police. He is known to be an alcoholic. On examination, he has a temperature of 39°C, a stiff neck and a positive Brudzinski and Kernig's signs. Meningitis is suspected and blood cultures and a lumbar tap are performed.

1. **What signs and symptoms are consistent with the diagnosis of meningitis?**
2. **What are the most likely pathogens in this case?**
3. **Empiric therapy is to be started immediately. Which agents would be appropriate for use in this patient by which route?**

4. **Results from the culture and sensitivity come back as**

Listeria monocytogenes

Sensitive: Ampicillin, Vancomycin

Would you make any changes to the original empiric therapy based on these results?

5. **How long should therapy be continued?**
6. **Would it be appropriate to use dexamethasone in this case?**