Managing meningitis — not just antibiotics

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December 2013
Case history

- 43 year old British-born Asian lady
- Legal advisor
- Married with a three year old child
  (on Amoxicillin for recent ear infection)
- Non smoker, no alcohol use

- Pulmonary TB aged 11 years – treated
- No other significant medical history
- No regular medications; no allergies
- Travelled to Canada a year ago
Developed high fever and headache whilst in London for work
Saw GP the next day who diagnosed ‘viral illness’
Headache worsened the next day and husband felt she was more unwell
Eyes closed, answering “yes/no” only
Saw GP again who referred to AMU
Ambulance observations

- GCS 15/15
- Temp 38.8°C
- BP 120/69
- Pulse 80 bpm
AMU assessment

- GCS 14/15 (opening eyes to voice)
- Temp 37.9°C
- BP 108/67
- Pulse 95 bpm
- Stiff neck, mild photophobia, no rash
- Pupils sluggish, could not see fundi
- Diplopia far left gaze
Investigations

- Venous blood gas: Bicarb 14, Lactate 6.2
- CRP 149, WBC 13.4
- Non contrast CT scan - normal
- LP performed: turbid, yellowish fluid
- WBC 3,020 (76% lymph, 24% poly)
- No organisms seen
- RBC 155
- Protein 6.77, Glucose <0.2
Differential diagnoses?
Differentials

- Turbid, yellowish fluid
- WBC 3,020 (76% lymph, 24% poly)
- RBC 155
- Protein 6.77, Glucose <0.2

1. **Bacterial meningitis**
   (~10% have predominant lymphocytic CSF)
2. **Tuberculous or fungal meningitis**
   but usually well, short history and WBC generally <1000 in these diagnoses
3. **NOT** viral meningitis
Changing aetiologies

- *Hib* vaccination significantly reduced *Haemophilus influenzae* type B invasive disease
- Meningococcal C vaccination has reduced the incidence of Men C meningitis
- Meningococcal B and *S. pneumoniae* remain commonest causes of adult bacterial meningitis in the UK
- Listeria in >55 yr olds (add Amoxycillin)
Further results

Blood cultures and CSF grew fully sensitive *Streptococcus pneumoniae*
Management

- Ceftriaxone 2g iv given shortly after LP performed
- Given Aciclovir as well for a short time
- One dose Dexamethasone 10mg iv given after the second dose of Ceftriaxone (the next day)
Florid leptomeningeal enhancement post-contrast
Progress

- Pyrexia slow to settle
- Left arm/leg weakness
- Left arm myoclonic jerks
- EEG normal – given Levetiracetam

- 4 weeks of antibiotics for presumed cerebritis complicating meningitis
Considerations

Would her clinical outcome have been different if she had received adjuvant corticosteroids before the first dose of antibiotics?

What is the evidence for steroids in bacterial meningitis?
Rationale for corticosteroids

- Animal modelling

- Inflammation in subarachnoid space worsened outcome in meningitis

- Steroids reduced inflammation, reduced brain oedema, cerebral vasculitis and improved outcomes
Cochrane meta-analysis 2013

- 25 RCT included, over 4,000 patients (high and low income countries)
- Reduced severe hearing loss, any hearing loss, and other short-term neurological deficits in high-income countries
- Reduced mortality in S. pneumoniae
- Non-significant reduction in mortality in adults overall
- Reduced severe hearing loss, any hearing loss, and other short-term neurological deficits in high-income countries
Unanswered questions

How long?
Cochrane recommends 4 days iv Dexamethasone as this was most common regimen

Which type of steroid?
Dexamethasone has best CSF penetration and duration of action so Cochrane recommended this at 0.6mg/kg/day divided into 4 doses

When to administer?
Subgroup analysis in Cochrane review did not support a specific approach, but recommends starting before or with the first dose of antibiotics
Current recommendations for immunocompetent adults

Dexamethasone 0.15mg/kg QDS iv before or with first dose of antibiotics

in cases of suspected bacterial meningitis – especially pneumococcal

for 4 days if proven pneumococcal aetiology


Figure 2. Management algorithm for adults with suspected bacterial meningitis. “Stat” indicates that the intervention should be done emergently.


Infectious Diseases Society of America - 2004 Bacterial Meningitis guidelines
Hospital management of Community Acquired Bacterial Meningitis in adults.

Guideline applies if:

Meningococcal meningitis suspected and accompanied by rash OR bacterial meningitis lacking any specific features. They are not intended for use in patients with post-operative meningitis or suspected TB meningitis. In these cases please refer to microbiology/infectious diseases for advice.

Treatment process:

- Make a provisional diagnosis
- Commence empirical treatment
- Consider referral to Infectious Diseases and ITU.
- Add Dexamethasone (prior to or with the first dose of antibiotic) if the patient has a high likelihood of bacterial meningitis, based on clinical features or CSF examination.
- Review therapy according to blood and/or CSF cultures.

It is essential to notify meningitis cases URGENTLY to the Consultant in Communicable Disease Control (CCDC). Inform local Health Protection Agency/Communicable Disease Control on 0844 2254524. If out-of-hours, phone 0115 9675099 and ask for doctor on-call for communicable diseases who will arrange contact tracing and prophylaxis where necessary.

The Full Guideline "Suspected bacterial meningitis or meningococcal septicaemia in immunocompetent adults" is available [here](#).

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Page last edited: 08/10/2013
Menigitis and Meningococcal septicemia guidelines.

This guideline covers the management of patients with suspected bacterial meningitis or meningococcal septicemia in immunocompetent adults following arrival at UHL. For management of patients identified as having suspected bacterial meningitis or meningococcal septicemia before they arrive at UHL, refer to the Antibiotic Guidelines for Primary Care.

Recognition, severity and immediate management

- Presence of non-blanching purpuric/petechial rash usually indicates meningococcal septicemia.
- Assess Airway, Breathing, Circulation and Neurology status
- Perform venous cannulation and venepuncture for investigations
- Administer appropriate antibiotics +/- steroids before radiological investigations
- Intravenous fluids and oxygen
- Isolate for 24 hours
- Inform Infectious Diseases Unit for transfer to isolation cubicle
- Inform ITU of all suspected cases of meningococcal septicemia or meningitis

Investigations

- Blood for: FBC, U&Es, glucose, LFTs, CRP, clotting, arterial blood gases, HIV serology
- Cultures of blood (essential), throat (bacterial and viral) and skin lesion aspirate
- Lumbar puncture (see below)
- ETDA blood sample to microbiology for Meningococcal and pneumococcal PCR

Antibiotic therapy

- Give ceftriaxone 2g iv immediately and continue twice daily initially
- For patients > 55 years or pregnant add iv amoxicillin 2g 4 hourly to cover listeria

If a patient has a history of rash to penicillin or cephalosporins then Meropenem 2g tds can be used to cover Neisseria Meningitidis, Streptococcus pneumoniae, Haemophilus influenzae and Listeria monocytogenes.

Review with microbiology if significant penicillin allergy or renal impairment.

Review with microbiology/ infectious diseases if travel abroad, lived in or close contact with persons who have lived in an endemic TB country or immunocompromised; as will need to consider giving empiric antimicrobials to cover TB, Listeria or fungal meningitis

Steroid therapy

Evidence suggests that steroids may be of benefit if given early, particularly if pneumococcal is suspected. In strongly suspected cases of bacterial meningitis consider administration of-Dexamethasone 0.15mg/kg (max 10mg) IV qds for 4 days (given with first antibiotic dose initially)

UHL and national (British Infection Society) guidelines
Key Learning Points

Meningitis

- Life-threatening
- Treatable

- Reduced mortality (Pneum) & neurological deficits

- Prompt CSF analysis (if LP >30mins, give Antibiotic stat)

- Early antibiotics AND steroids recommended
  in suspected BACTERIAL MENINGITIS

- Reduced mortality & neurological deficits