

## 29 MENINGITIS

### SYMPTOMS AND SIGNS

Ask about:

- fever <sup>B</sup>
- nausea and vomiting <sup>A</sup>
- headache <sup>B</sup>
- neck stiffness <sup>B</sup>
- photophobia. <sup>D</sup>

#### Think about other causes of headache: <sup>D</sup>

- subarachnoid haemorrhage
- encephalitis
- cerebral abscess
- other causes of raised intracranial pressure
- migraine.

Look for:

- fever <sup>B</sup>
- + neck stiffness <sup>B</sup>
- altered mental state <sup>B</sup>
- photophobia <sup>D</sup>
- rash
- + Kernig's sign (positive if your patient's headache worsens on flexing the legs at the hip and extending them at the knees) <sup>B</sup>
- jolt accentuation (positive if your patient's headache worsens on rotating the head 2 or 3 times) <sup>A</sup>
- raised intracranial pressure
  - papilloedema
  - absence of retinal vein pulsation.

#### Common causes of meningitis include: <sup>D</sup>

- *Neisseria meningitidis*
- *Streptococcus pneumoniae*
- Gram-negative bacilli.

Remember:

- *Listeria monocytogenes*
- *Haemophilus influenzae*
- tuberculosis
- *Cryptococcus*
- viral infection (Coxsackie, ECHO virus, mumps, polio).

## INVESTIGATIONS

- Blood count. <sup>D</sup>
- Clotting studies. <sup>D</sup>
- U&E, creatinine. <sup>A</sup>
- Glucose. <sup>D</sup>
- Blood cultures. <sup>A</sup>
- Chest X-ray. <sup>D</sup>
- Throat swab. <sup>D</sup>
- Lumbar puncture: <sup>A</sup>
  - send CSF for:
    - Gram stain and cell count <sup>A</sup>
    - culture <sup>A</sup>
    - glucose and protein. <sup>C</sup>

For interpretation of results, see Table 29.1.

### Lumbar puncture

- Consider arranging a CT brain scan before performing the lumbar puncture, particularly if there is: <sup>A</sup>
  - papilloedema
  - focal neurological signs
  - altered mental state.
- Use a narrow-gauge, non-cutting needle, <sup>A</sup> through a bleb of local anaesthetic. <sup>C</sup>
- Replace the stylet before withdrawing the needle. <sup>A</sup>
- There is no clear benefit from bedrest post-lumbar puncture – it does not reduce lumbar-puncture headache. <sup>D</sup>

**Table 29.1 Typical cerebrospinal fluid results <sup>D</sup>**

	Cell count /m <sup>3</sup>	Main cell type	Protein g/dl	CSF: blood glucose
Bacterial	> 1000	Polymorphs	> 1.5	< 50%
Viral	< 500	Lymphocytes	0.5 to 1	> 50%
TB	< 500	Lymphocytes	1 to 5	< 50%
Fungal	< 150	Lymphocytes	0.5 to 1	< 50%

Consider:

- sending for PCR if viral meningitis suspected. <sup>C</sup>
- using a leukocyte-esterase reagent dipstick to detect bacterial meningitis. <sup>B</sup>

### Note

A positive or trace reading on leukocyte-esterase dipstick makes bacterial meningitis more likely. <sup>B</sup>

## THERAPY

- Resuscitate and seek help if needed.
- Give antibiotics <sup>A</sup> once meningitis is suspected, <sup>D</sup> e.g. ceftriaxone 2 to 4 g i.v. daily.

Consider giving:

- ampicillin 500 mg i.v. to elderly patients <sup>D</sup>
  - aciclovir 10 mg/kg i.v. over 1 hour every 8 hours if herpes simplex encephalitis is a possibility.
- Give analgesia. <sup>A</sup>
  - Treat sepsis – patients may require: <sup>D</sup>
    - central venous access
    - a urinary catheter
    - transfer to an intensive care unit.

## REVIEW

Contact your local communicable disease team to arrange chemoprophylaxis for household contact of patients with *Neisseria meningitidis* meningitis.

### Chemoprophylaxis

Give a single dose of oral rifampicin 600 mg twice daily for 2 days <sup>A</sup> or ceftriaxone 250 mg i.m. once. <sup>A</sup>

### Outcomes

- Around a quarter of patients with bacterial meningitis die, <sup>B</sup> though only one in fifteen with meningococcal meningitis dies.
- A quarter develop seizures, <sup>B</sup> and long-term neurological problems are common, with one in nine having severe disability. <sup>C</sup>
- Viral meningitis is less severe, with only one in nine having a serious illness. <sup>C</sup>

## 30 MYOCARDIAL INFARCTION

### SYMPTOMS AND SIGNS

#### Myocardial infarction

Defined as two of:

- chest pain lasting 20 minutes or more
- a characteristic rise and fall of cardiac enzymes
- characteristic ECG changes.

Ask about:

- the pain, specifically:
  - its position, <sup>B</sup> looking for:
    - + chest or left arm pain <sup>B</sup>
  - its duration, <sup>A</sup> looking for:
    - + chest pain which started  $\geq$  48 hours ago <sup>A</sup>
    - + constant pain <sup>B</sup>
  - its nature, <sup>A</sup> looking for:
    - + pressure <sup>A</sup>
    - no sharp or stabbing pain <sup>A</sup>
    - no pleuritic pain <sup>A</sup>
    - no positional pain <sup>A</sup>
  - any radiation <sup>A</sup> particularly to:
    - + both arms <sup>B</sup>
    - + the right shoulder <sup>B</sup>
    - + the left arm <sup>B</sup>
  - + any similarity to previous infarcts or angina attacks <sup>A</sup>
  - any exacerbating or relieving factors, <sup>B</sup> particularly:
    - + pain brought on by exertion
    - + pain relieved by nitrates or rest

#### Other common causes of chest pain include: <sup>C</sup>

- angina
- pulmonary embolism
- chest infection
- musculoskeletal pain
- pericarditis.

#### Rarer causes include: <sup>D</sup>

- aortic dissection
- oesophageal spasm
- oesophageal rupture

- abdominal pain
  - gallstones
  - gastritis
- herpes zoster.

- + any nausea or vomiting <sup>A</sup>
- + any sweating <sup>B</sup>
- a history of:
  - + angina or MI <sup>A</sup>
  - + heart failure <sup>A</sup>
  - + an acute respiratory infection in the previous 10 days <sup>B</sup>
- cardiovascular risk factors:
  - hypertension <sup>A</sup>
  - smoking <sup>B</sup>
  - diabetes mellitus <sup>A</sup>
  - elevated total cholesterol or triglycerides <sup>A</sup>

**Note**

Cardiovascular risk factors are not very helpful at diagnosing a myocardial infarction, but increase the risk of complications and death. <sup>B</sup>

- usual levels of activity <sup>A</sup>
- a parental history of angina or MI before the age of 60. <sup>A</sup>

Look for:

- + sweating <sup>B</sup>
- + hypotension <sup>B</sup>
- Kussmaul's sign (JVP rising during quiet inspiration) <sup>C</sup>

**Note**

Kussmaul's sign makes right ventricular infarction more likely in patients with an inferior MI. <sup>C</sup>

- + a third <sup>B</sup> or fourth heart sound <sup>C</sup>
- chest pain that is reproduced on palpation <sup>A</sup>
- + pulmonary crackles. <sup>A</sup>

**INVESTIGATIONS**

- Blood count. <sup>B</sup>

**Note**

A high leukocyte count makes a myocardial infarction more likely. <sup>B</sup>

- U&E, creatinine. <sup>D</sup>
- Glucose. <sup>A</sup>
- Serial cardiac enzymes:
  - ± CK-MB over 24 hours <sup>C</sup>
  - ± troponin T <sup>C</sup>
  - ± creatinine kinase <sup>B</sup> over 48 hours with:
    - + lactate dehydrogenase. <sup>A</sup>

#### Note

- An early CK-MB rise diagnoses a myocardial infarction and normal levels at 20 hours rule it out. <sup>C</sup>
- A normal troponin T or troponin I at 20 hours makes an infarct unlikely. <sup>C</sup>
- Elevated creatinine kinase levels <sup>B</sup> or an elevated myoglobin<sup>C</sup> diagnoses an infarct.
- CK, AST or LDH taken on presentation cannot safely diagnose or exclude an infarct. <sup>A</sup>

- Lipid levels. <sup>A</sup>
- ± 12-lead ECG, <sup>A</sup> followed by serial ECGs. <sup>B</sup>
- Chest X-ray. <sup>A</sup>

#### ECG

- Look for features suggesting cardiac ischaemia:
  - any ST elevation in two or more leads <sup>A</sup>
  - any ST depression <sup>B</sup>
  - any Q waves <sup>A</sup>
  - any T wave inversion <sup>B</sup>
  - any conduction defect. <sup>B</sup>
- These are more significant if present in two or more leads, or not known to be old.
- A normal ECG makes life-threatening complications unlikely. <sup>C</sup>

Use the clinical prediction rule given in Table 12.1 (p. 50) to rank your patient for risk of a myocardial infarction. <sup>A</sup>

## THERAPY

- Give oxygen. <sup>D</sup>
- Give analgesia: <sup>A</sup>
  - nitrous oxide with oxygen <sup>B</sup>
  - opiate analgesia, <sup>A</sup> e.g. diamorphine 1 mg/min i.v. until pain relieved (up to 10 mg)
- Metoclopramide <sup>D</sup> 10 mg i.v. over 1 to 2 min.

- Give aspirin <sup>A</sup> 300 mg orally, <sup>D</sup> then 75 mg daily. <sup>A</sup> Alternatives include:
  - clopidogrel <sup>A</sup> 525 mg daily, then 75 mg daily.

For patients with pain that started within 12 hours and any of:

- > 2 mm ST elevation in two adjacent limb leads
- > 1 mm ST elevation in two adjacent chest leads
- new LBBB:
- Offer primary angioplasty if available. <sup>A</sup>
- Otherwise give thrombolysis <sup>A</sup> as soon as possible <sup>A</sup> if there are no contraindications.

#### Contraindications to thrombolysis

- active bleeding <sup>A</sup>
- recent surgery or trauma <sup>C</sup>
- recent stroke <sup>A</sup>
- active peptic ulcer disease <sup>D</sup>
- evidence of aortic dissection. <sup>D</sup>

Ideally use reteplase <sup>A</sup> or tPA (alteplase), <sup>A</sup> followed by a heparin infusion for 24 hours, particularly for:

- older patients <sup>A</sup>
- patients with an anterior MI <sup>A</sup>
- patients who have received streptokinase or anistreplase longer than 4 days ago. <sup>D</sup>

Otherwise use streptokinase. <sup>A</sup>

#### Thrombolysis

- Reteplase: 10 units over 1 to 2 minutes, followed by another 10 units 30 minutes later.
- tPA (alteplase): 15 mg i.v. over 1 to 2 minutes, followed by 50 mg i.v. over 30 minutes, then 35 mg over 60 minutes (max 1.5 mg/kg in patients > 65 kg).
- Streptokinase: 1.5 million units in 100 ml 0.9% saline, given over 1 hour.

#### Heparin

- Add 25 000 units heparin to 50 ml 0.9% saline.
- Give a bolus of 5000 units, then infuse at 1000 units/hr (2 ml/h).
- Check aPTT 6 hours later. Aim for an aPTT ratio 1.5 to 2.5.

See Chapter 19 for more details on heparin dosing.

#### Note

- One in eight patients has a moderate or severe bleed after thrombolysis. <sup>B</sup>
- 1% have a stroke. <sup>B</sup>

Give patients with an admission glucose  $> 11.0$  mmol/L: <sup>A</sup>

- an insulin–glucose infusion for 24 hours, followed by subcutaneous insulin four times daily for at least 3 months.

### An insulin infusion regimen

Add 50 units of actrapid (soluble) insulin to 50 ml of 0.9% saline. Infuse using the following sliding scale.

Glucose mmol/L	Infusion rate units/hr
0 to 4	0.5 and 10% or 20% glucose infusion
4 to 8	1
8 to 12	2
12 to 16	3
16 to 20	4
$>20$	6 and call doctor

The regimen may need to be adjusted depending on your patient's response.

Start:

- a beta-blocker <sup>A</sup> once thrombolysis is completed, <sup>A</sup> e.g. metoprolol 25 mg three times a day, or atenolol 50 mg daily.
- an ACE inhibitor <sup>A</sup> within 36 hours, particularly for patients with:
  - a reduced LV ejection fraction ( $< 40\%$ ), <sup>A</sup> unless patients have cardiogenic shock or a systolic blood pressure  $< 100$  mmHg <sup>C</sup>
  - one other cardiovascular risk factor (hypertension, hypercholesterolaemia, low HDL levels, smoking or documented microalbuminuria). <sup>A</sup>

### ACE inhibitors

- Monitor the blood pressure for the first dose. <sup>D</sup>
- Increase the dose if patients tolerate it.
- Typical doses:
  - enalapril 2.5 to 5 mg daily initially, increasing to 10 to 20 mg daily.
  - perindopril 1 mg daily initially increasing to 4 to 8 mg daily.
  - ramipril 1.25 mg daily initially increasing to 5 mg daily. <sup>A</sup>
- Monitor the renal function. <sup>A</sup>

Consider:

- anticoagulating patients with an anterior MI who do not receive thrombolysis <sup>A</sup>
- giving an LMWH long-term <sup>A</sup>
- amiodarone. <sup>A</sup>

**Amiodarone**

Loading dose:

- intravenous:
  - preferably via a central line
  - Give 300 mg (5 mg/kg) in 250 ml 5.0% glucose over 1 hour, followed by 900 mg over 24 hours.
- oral:
  - Give 200 mg every 8 hours for 1 week, then 200 mg every 12 hours for 1 week, then start maintenance therapy.

Maintenance dose:

- Patients should be given a total loading dose of 4200 mg before starting on maintenance therapy. <sup>D</sup>
- Give 100 to 200 mg daily.

**REVIEW**

- Observe patients for at least 5 days. <sup>D</sup>
- Repeat cardiac enzymes <sup>A</sup> and ECGs <sup>A</sup> daily for at least 2 days. <sup>D</sup>

Ask about:

- further chest pain <sup>A</sup>
- dyspnoea <sup>A</sup>
- palpitations. <sup>A</sup>

**Angina**

See Chapter 6 for more information.

Look for: <sup>B</sup>

- Arrhythmias, particularly AV block, VF or sustained VT:
  - Give amiodarone to patients with ventricular arrhythmias. <sup>A</sup>
  - Avoid using:
    - class Ic anti-arrhythmic agents <sup>A</sup>
    - sotalol. <sup>A</sup>

**Arrhythmias**

- One in five has an episode of bradycardia within 4 hours, but many settle, with only a tenth having symptoms after this time. <sup>B</sup> Bradycardia is commoner in inferior MI. <sup>A</sup>

See Chapters 8 (bradyarrhythmias) and 40 (tachycardias) for more information.

- New murmurs or a pericardial rub, particular evidence of: <sup>B</sup>
  - mitral regurgitation <sup>B</sup>
  - ventricular septal rupture <sup>B</sup>
  - ventricular aneurysms. <sup>B</sup>

**Note**

- One in 14 develops mitral regurgitation. <sup>B</sup>
- One in 50 develops ventricular rupture <sup>B</sup> – half will die. <sup>B</sup>

Give NSAIDs if there is evidence of pericarditis. <sup>C</sup>

Start anticoagulation if a ventricular aneurysm is present. <sup>A</sup>

- Signs of heart failure, <sup>B</sup> particularly cardiogenic shock. <sup>A</sup>

**Heart failure****Killip class** <sup>C</sup>**Signs**

<b>I</b>	No clinical signs of heart failure
<b>II</b>	Crackles, S <sub>3</sub> gallop and elevated JVP
<b>III</b>	Frank pulmonary oedema
<b>IV</b>	Cardiogenic shock, hypotension (systolic BP < 90 mmHg), evidence of peripheral vasoconstriction (oliguria, cyanosis, sweating)

**Note**

One in 14 develops cardiogenic shock <sup>A</sup> – half will die. <sup>A</sup>

See Chapter 21 for more information on congestive heart failure.

Provide cardiac rehabilitation involving: <sup>A</sup>

- a structured exercise programme <sup>A</sup>
- psychosocial interventions <sup>A</sup> – encourage patients to be realistic about their illness. <sup>C</sup>

Target cardiac risk factors:

- Encourage patients to stop smoking <sup>A</sup> and ask nurses <sup>A</sup> and other staff <sup>A</sup> to provide further advice.

Offer:

- nicotine patches <sup>A</sup> or gum <sup>A</sup>
- bupropion. <sup>A</sup>
- Treat hypertension. <sup>A</sup>
- Optimize diabetes control. <sup>A</sup>
- Lower cholesterol levels <sup>A</sup> even for patients with average levels (cholesterol 4.0 to 6.2 mmol/L) <sup>A</sup> using:
  - diet modification. <sup>A</sup> Encourage patients to eat a Mediterranean-style diet <sup>A</sup>

**Dietary advice**

- Eat more bread, more root and green vegetables, fish, and oats. <sup>A</sup>
- Eat less meat – replace beef, lamb, pork with poultry.
- Have no day without fruit.
- Replace butter and cream with margarine, rapeseed and olive oils.
- Eat more soy protein. <sup>B</sup>

- a statin <sup>A</sup>

**Statins**

Start at a low dose and increase to the maximum tolerated e.g.: <sup>D</sup>

- atorvastatin 40 mg at night
- pravastatin 40 mg at night
- simvastatin 40 mg at night.

- gemfibrozil 600 mg twice daily for patients with low HDL levels. <sup>A</sup>

Consider giving patients:

- n-3 polyunsaturated fatty acid supplements <sup>A</sup>
- vitamin E supplements <sup>A</sup> 400 mg daily.

**Stress-testing**

Perform stress-testing before discharge or as an outpatient <sup>D</sup> using the guide in Chapter 6 (page 27).

**Outcomes**

- One in 30 dies within 10 days, <sup>A</sup> rising to one in eight at 2 years, <sup>B</sup> and 60% at 10 years. <sup>B</sup>
- One in 40 has another MI within a year <sup>A</sup> – a third have another MI within 10 years. <sup>B</sup>
- One in nine develops angina within a year. <sup>A</sup>
- A third of patients with ventricular aneurysms die within 5 years. <sup>B</sup>
- One in 18 has an episode of VF within 6 months – one in five dies. <sup>B</sup>