



Shabna Rajapaksa
Mike Starr

Meningococcal sepsis

Background

Meningococcal disease remains a significant illness with an overall mortality of around 8%. The majority of deaths occur in the first 24 hours, before the commencement of specialist care. Missing a diagnosis of meningococcal disease is a fear among health care practitioners.

Objective

This article presents a guide to identifying the salient features of meningococcal sepsis and initial management strategies in the primary care setting.

Discussion

Initial presentation is often nonspecific and therefore it is important to have a high index of suspicion in children presenting with fever, lethargy, myalgia, vomiting and headache. These children should be monitored and reviewed carefully. If a nonblanching rash develops, immediate treatment, liaison with a paediatric intensive care unit and urgent hospital transfer is required. Initial management involves assessment and regular review of airway, breathing and circulation. Antibiotics (preferably intravenous cephalosporin) should be administered before hospital transfer.

Keywords: child health; emergencies; communicable/infectious diseases; diagnosis, differential; meningococcal infections



Meningococcal disease, presenting as either meningitis or septicaemia, remains a significant illness, even with the introduction of the conjugate meningococcal C vaccine. Meningococcal disease is caused by the bacterium *Neisseria meningitidis* and mainly affects children under the age of 5 years and adolescents. The overall mortality of the disease is around 8% (5% for meningitis and 15–20% for sepsis), which is improved significantly with the early administration of antibiotics.^{1–3} The majority of deaths occur in the first 24 hours, before the commencement of specialist care and therefore the challenge for first line physicians is to identify those patients who will progress from nonspecific early presentation to fulminant disease.⁴

Making the diagnosis

This article focuses on meningococcal sepsis rather than meningococcal meningitis. Both invasive forms of meningococcal disease can occur concurrently, and this should be kept in mind when managing these patients.

Acute meningococcaemia presents in a nonspecific manner with fever, lethargy, reduced feeding, headache, nausea and vomiting, cold or discoloured extremities, arthralgia and myalgia. These symptoms are similar to those caused by nonthreatening viruses, making a confident diagnosis in these early stages difficult.

Key points in assessment

- Have a high index of suspicion – always consider the possibility of meningococcal disease in the presence of nonspecific symptoms such as fever, headache, lethargy and vomiting
- Children with nonspecific symptoms should be reassessed in 4–6 hours by the same doctor, if possible and appropriate
- Advise carers to seek further medical assessment if there is a change or deterioration in the child's condition, eg. development of a nonblanching rash. Be particularly suspicious if the patient re-presents
- Any child presenting with the symptoms listed above should be considered to have meningococcal disease and treatment commenced as soon as possible.

The initial nonspecific stage of meningococcal disease can last for several hours and then progress to one of three scenarios:



- meningococcal sepsis
- meningococcal meningitis, or
- both (Table 1).⁵

Approximately 95–99% of children with fever and petechiae will have a cause other than meningococcal infection (eg. enterovirus). However, it may not be easy to distinguish between the two without investigations and/or a period of observation. Figure 1–3 illustrate the nonblanching rash.

Initial management

If meningococcal disease is suspected the key role for the general practitioner is to provide resuscitation, urgent referral to hospital, and the administration of appropriate antibiotics.

Remember

- Do not delay treatment by interval assessment or pending investigations
- Administer antibiotics (see below)
- Organise urgent hospital transfer (a child requiring active resuscitation is likely to require admission to a high dependency/intensive care unit)
- Continue to assess and manage the patient until suitable transfer transport has arrived.

Management while awaiting hospital transfer

Management should focus on airway, breathing and circulation, with ongoing reassessment. These patients often require fluid resuscitation, and this may be given as crystalloid or colloid via the intravenous (IV) or intraosseous route. Normal saline is the preferred fluid. An initial dose of 20 mL/kg is recommended with early reassessment. It is not uncommon to require several boluses of fluid; once 60 mL/kg has been delivered, consideration for the need for inotropes and definitive airway support (risk of pulmonary oedema) must be made.⁶

In arranging hospital transfer, liaise with the local paediatric intensive care unit for advice on management and the need for an intensive care team to transport the patient.

Antibiotics and route of administration

Prehospital antibiotics are recommended to prevent death and associated disability.^{2,3,7–12} Due to the ethical nature of conducting randomised controlled trials in this area, there is little data to support which antibiotic or route of administration is most desirable. Parenteral benzylpenicillin is recommended and this is readily available. Currently all meningococcal isolates are sensitive to penicillin, but as other invasive pathogens (*Streptococcus pneumoniae* and *Haemophilus influenzae* type b) can cause invasive disease that presents in a similar manner to meningococcus, a broader spectrum antibiotic, such as a third

Table 1. Symptoms and signs of meningococcal septicaemia and meningococcal meningitis

| | Symptoms and signs |
|-------------------------------------|--|
| Meningococcal sepsis | Fever Reduced feeding Arthralgia/myalgia Petechiae/purpura Cold/discooured extremities Lethargy/drowsiness/confusion Shock |
| Meningococcal meningitis | Fever Headache Irritability Lethargy/drowsiness/confusion Vomiting Neck stiffness Photophobia Infants: high pitched cry; full or bulging fontanelle Positive Kernig sign (pain on flexing hip to 90 degrees and knee extended) Positive Brudzinski sign (flexing neck causes flexion of hips and knees) |
| Meningococcal sepsis and meningitis | Any or all of the above |



Figure 1. Nonblanching petechial rash

generation cephalosporin (ceftriaxone or cefotaxime), is preferred if available.

If neither cephalosporin nor benzylpenicillin are available, ampicillin or amoxicillin may be given, and in the case of hypersensitivity to cephalosporins or penicillins, chloramphenicol is recommended.⁹

Intravenous administration is the preferred route. However, obtaining IV access in this group of patients may be difficult due to a compromised circulatory system. A dose of antibiotics may be administered via a 'butterfly' needle or via the intraosseous route. Intramuscular administration is the least preferred, as shock and hypotension impair absorption of the drug. However, this is preferable to giving no antibiotics.



Figure 2. The nonblanching rash can be quite subtle



Figure 3. Florid purpuric rash on a baby with meningococcal sepsis

Blood culture

If it is possible to obtain a blood culture before administering antibiotics, this should be done. However, it should not delay treatment.⁹ This specimen can accompany the patient to hospital.

Contacts

Clearance antibiotics should be given to those who have had close contact with the patient within 7 days of the onset of the illness. They should be commenced as soon as possible after diagnosis. Details regarding what constitutes a close contact and specific antibiotic regimens are beyond the scope of this article. They can be found in Sections 8.3 and 8.6 of the Australian *Guidelines for the early clinical and public health management of meningococcal disease in Australia*.⁹

Summary of important points

- Have a high index of suspicion in children with nonspecific symptoms of fever, lethargy, myalgia, vomiting and headache.
- In the presence of the above and a nonblanching rash, consider immediate treatment and hospital assessment.
- Assess airway, breathing and circulation.
- Administer antibiotics before hospital transfer (preferably IV cephalosporin).
- Liaise with the local hospital and paediatric intensive care unit regarding transfer and further management.

Authors

Shabna Rajapaksa MA, MB, BChir, MRCPCH, is a paediatric registrar, Emergency Department, Royal Children's Hospital, Melbourne, Victoria. shabnarajapaksa@doctors.net.uk

Mike Starr MBBS, FRACP, is a paediatrician, infectious diseases physician, consultant in emergency medicine, and Director, Paediatric Physician Training, Royal Children's Hospital, Melbourne, Victoria.

Conflict of interest: none declared.

References

1. Calman K. Meningococcal infection: meningitis and septicaemia. London: Department of Health, 1994, PL/CMO(94)2.
2. Cartwright K, Reilly S, White D, Stuart J. Early treatment with parenteral penicillin in meningococcal disease. *BMJ* 1992;305:143–52.
3. PHLS Meningococcal Infections Working Group and Public Health Medicine Environmental Group. Control of meningococcal disease: guidance for consultants in communicable disease control. *CDR Rev* 1995;13:189–95.
4. Tibby SM, Murdoch IA, Durward A. Mortality in meningococcal disease: please report the figures accurately. *Arch Dis Child* 2002;87:559.
5. Riordan F, Marzouk O, Thomson AP, Sills JA, Hart CA. The changing presentations of meningococcal disease. *Eur J Pediatr* 1995;154:472–4.
6. Advanced Life Support Group. Advanced paediatric life support: the practical approach. 4th edn. Sydney: BMJ Publishing Group, 2004.
7. Hodgetts TJ, Brett A, Castle N. The early management of meningococcal disease. *J Accid Emerg Med* 1998;15:72–6.
8. Samuelsson S. Meningococcal disease – still a major challenge. *Commun Dis Public Health* 2002;5:178–80.
9. Communicable Diseases Network Australia. Guidelines for the early clinical and public health management of meningococcal disease in Australia. Canberra: CDNA Commonwealth of Australia, 2007. Available at [www.health.gov.au/internet/main/publishing.nsf/Content/BC329B583B663546CA25736D007674AA/\\$File/meningococcal-guidelines.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/BC329B583B663546CA25736D007674AA/$File/meningococcal-guidelines.pdf).
10. Chin J, editor. Control of communicable diseases manual. 17th edn. Washington DC: The American Public Health Association, 2000.
11. Strang JR, Pugh EJ. Meningococcal infections: reducing the case fatality rate by giving penicillin before admission to hospital. *BMJ* 1992;305:141–3.
12. Tunkel AR, Scheld WM. Acute bacterial meningitis. *Lancet* 1995; 346:1675–80.

correspondence afp@racgp.org.au