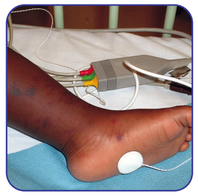
Early Management of Meningococcal Disease in Children*

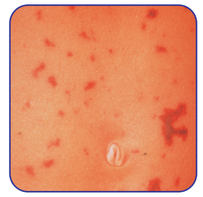
5th Edition



RECOGNITION

May present with predominant SEPTICAEMIA (with shock), MENINGITIS (with raised ICP) or both. Purpuric/petechial non-blanching rash. Rash may be atypical or absent in some cases.

- Call consultant in A&E, Paediatrics, Anaesthesia or Intensive Care
- Initial assessment, looking for features of early shock/raised ICP
- DO NOT ATTEMPT LUMBAR PUNCTURE
- IV Cefotaxime (50mg/kg) or Ceftriaxone (80mg/kg)



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SIGNS OF EARLY COMPENSATED SHOCK ?
- Tachycardia
- Cool peripheries/pallor
- Increased capillary refill time (> 4 sec)
- Tachypnoea/pulse oximetry < 95%
- Hypoxia on arterial blood gas
- Base deficit (worse than -5 mmol/l)
- Confusion/drowsiness/decreased conscious level
- Poor urine output (< 1ml/kg/hr)
- Hypotension (late sign)

NO

RAISED INTRACRANIAL PRESSURE ?
- Decreasing or fluctuating level of consciousness
- Hypertension and relative bradycardia
- Unequal, dilated or poorly reacting pupils
- Focal neurological signs
- Abnormal posturing or Seizures
- Papilloedema (late sign)

YES

- ABC and Oxygen (10 l/min), bedside glucose
- Insert 2 large i.v. cannulae (or intra-osseous)

VOLUME RESUSCITATION
- Boluses of 20ml/kg of colloid (preferably 4.5% albumin) or crystalloid solutions over 5-10 minutes and review
- Repeat fluid bolus if necessary over 5-10 minutes
- Observe closely for response/deterioration

Do not attempt lumbar puncture

YES

- ABC and Oxygen (10 l/min), bedside glucose
- Give Mannitol (0.25 g/kg) bolus over 5 minutes followed by Frusemide (1 mg/kg)
- Steroids (Dexamethasone 0.4 mg/kg bd x 2 days)
- Treat shock if present

Call anaesthetist and contact PICU
- Intubate and ventilate to control $PaCO_2$ (4-4.5 kPa)
- Urinary catheter and monitor output, NG tube

Do not attempt lumbar puncture

NO

CLINICAL FEATURES OF MENINGITIS ?

After 40 ml/kg to 60 ml/kg fluid resuscitation STILL SIGNS OF SHOCK ?

NO → Repeated Review

YES

WILL REQUIRE ELECTIVE INTUBATION AND VENTILATION
Call anaesthetist and contact PICU
- Continue boluses of 10-20 ml/kg of colloid or crystalloid with review
- Start peripheral inotropes (Dopamine, Dobutamine)
- Nasogastric tube and urinary catheter
- ET tube (cuffed if possible) and CXR
- Anticipate pulmonary oedema (ensure PEEP)
- Central venous access
- Start Adrenaline infusion (central) if continuing need for volume resuscitation and peripheral inotropes

NEUROINTENSIVE CARE
- 30° head elevation, midline position
- Avoid internal jugular lines
- Repeat Mannitol and Frusemide if indicated
- Sedate (muscle relax for transport)
- Cautious fluid resuscitation (but correct coexisting shock)
- Minimal handling, monitor pupillary size and reaction

YES

Dexamethasone (0.4mg/kg bd x 2 days)

NO

Anticipate, monitor and correct:
- Hypoglycaemia
- Acidosis
- Hypokalaemia
- Hypomagnesaemia
- Hypocalcaemia
- Anaemia
- Coagulopathy (fresh frozen plasma 10 ml/kg)
- Raised intracranial pressure

STEPWISE TREATMENT OF SEIZURES
- i.v. Lorazepam (0.1 mg/kg) or Midazolam (0.1 mg/kg) bolus
- Consider Paraldehyde (0.4 ml/kg PR)
- Phenytoin (18 mg/kg over 30 min i.v. with ECG monitoring)

If persistent seizures:
- Thiopentone 4 mg/kg in intubated patients (beware of hypotension)
- Midazolam/Thiopentone infusion

Close monitoring for signs of raised ICP and repeated review. Consider LP if no contraindication (DO NOT DELAY ANTIBIOTICS)

Transfer to Intensive Care

Repeated Review

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Estimate of child's weight (1-10 years)
Weight (kg) = 2 x (age in years + 4)

Normal systolic blood pressure = 80 + (age in years x 2)
N.B. Low BP is a pre-terminal sign in children

Conscious Level
Alert
Responds to Voice
Responds to Pain
Unresponsive

Normal Values

Age	Respiratory Rate/min	Heart Rate/min
<1	30-40	110-160
1-2	25-35	100-150
2-5	25-30	95-140
5-12	20-25	80-120
>12	15-20	60-100

Observe HR, RR, BP, Perfusion, Conscious Level
Cardiac monitor and pulse oximetry. Take blood for Glucose, FBC, Clotting, U&E, Ca^{++}, Mg^{++}, PO_4, Blood cultures, Blood Gas (bicarb, base deficit), Cross-match

Inotropes
Dopamine or Dobutamine at 10-20 mcg/kg/min. Make up 3 x weight (kg) mg in 50 ml 5% dextrose and run at 10 ml/hr = 10 mcg/kg/min.
(These dilute solutions can be used via a peripheral vein.)
Start Adrenaline via a central line only at 0.1 mcg/kg/min. Make up 300 mcg/kg in 50 ml of normal saline at 1 ml/hour = 0.1 mcg/kg/min.

Intubation (call anaesthetist)
Atropine 20 mcg/kg (max 600 mcg) AND Thiopentone 3-5 mg/kg AND Suxamethonium 2 mg/kg (caution, high potassium) ETT size = age/4 + 4, ETT length (oral) = age/2 + 12 (use cuffed ET tube if possible). Then: morphine (100 mcg/kg) and midazolam (100 mcg/kg) every 30 mins.

Hypoglycaemia (Glucose < 3 mmol/l)
5ml/kg 10% dextrose bolus i.v. and then dextrose infusion at 80% of maintenance requirements over 24 hours.

Correction of metabolic acidosis pH < 7.2
Give half correction $NaHCO_3$ i.v.
Volume (ml) to give = (0.3 x weight in kg x base deficit ÷2) of 8.4%$NaHCO_3$ over 20 mins, or in neonates, volume (ml) to give
= (0.3 x weight in kg x base deficit) of 4.2% $NaHCO_3$.

If K^+< 3.5 mmol/l
Give 0.25 mmol/kg over 30 mins i.v. with ECG monitoring.
Caution if anuric.

If total Calcium < 2 mmol/l or ionized Ca^{++}< 1.0
Give 0.1 ml/kg 10% $CaCl_2$ (0.7 mmol/ml) over 30 mins i.v. (max 10 ml) or 0.3 ml/kg 10% Ca Gluconate (0.22 mmol/ml) over 30 mins (max 20 ml).

If Mg^{++}< 0.75 mmol/l
Give 0.2 ml/kg of 50% $MgSO_4$ over 30 mins i.v. (max 10 ml).

Prophylaxis of household contacts
Inform Public Health, Give Rifampicin (bd for 2 days)
< 1yr 5 mg/kg • 1-12yrs 10 mg/kg • > 12yrs 600 mg
or Ceftriaxone (single im dose)
< 12yrs 125 mg • > 12yrs 250 mg
or Ciprofloxacin as single 500 mg dose (not in children <2 or in pregnancy)
< 12 yrs 250 mg • > 12yrs 500 mg

Diagnosis
LP may be important if the diagnosis or aetiology is in doubt, i.e. when meningeal symptoms predominate and where no rash is present, or in infants with fever without a focus. It must not be performed when there are contraindications (e.g. RICP, shock, coagulopathy). LP should never delay treatment.
Blood Cultures, throat swab, whole blood (EDTA specimen) for PCR. CSF (if available) for culture and PCR. Rapid latex antigen test and aspirations/scrapings from skin showing haemorrhagic rash (if locally useful).

Serology
For suspected cases with no isolate or where PCR does not identify serogroup, clotted blood sample to reference laboratory† (acute within 72 hrs and convalescent 10-28 days after presenting symptoms).

Isolates and PCR samples from hospitals in England, Wales and Northern Ireland (local protocols for PCR services may apply)
†HPA Meningococcal Reference Unit
Tel: 0161 276 6757 Fax: 0161 276 5744

Isolates and PCR samples from hospitals in Scotland
†Scottish Meningococcus and Pneumococcus Reference Laboratory
Tel: 0141 201 3836

For further copies of this resource call Meningitis Research Foundation 01454 281811

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(**Arch Dis Child*, March 1999; 80: 290-296)

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