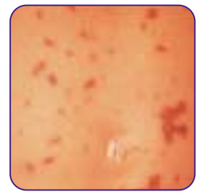
Early Management of Meningococcal Disease in Children*

4th 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
- i.v. Cefotaxime (80 mg/kg) or Ceftriaxone (80 mg/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

- Colloid bolus (20 ml/kg 4.5% HAS) and review
- Repeat colloid bolus if necessary
- 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 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 ?

YES

Dexamethasone (0.4mg/kg bd x 2 days)

NO

Close monitoring for signs of raised ICP and repeated review

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
- Start peripheral inotropes (Dopamine, Dobutamine)
- Nasogastric tube and urinary catheter
- Consider cuffed ET Tube and CXR
- Anticipate pulmonary oedema (consider PEEP)
- Central venous access
- Start Adrenaline infusion (central) if poor response to 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

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

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)

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

Colloid bolus (20ml/kg)
4.5% Human Albumin Solution (or Fresh Frozen Plasma or Hemaccel/Gelofusine) i.v. or intra-osseous

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, 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
1 mmol/kg $NaHCO_3$ i.v. = 1 ml/kg 8.4% $NaHCO_3$ over 20 mins or
2 ml/kg 4.2% $NaHCO_3$ in neonates

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 Department, 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 (adults only)

Diagnosis
Blood cultures, throat swab, whole blood (EDTA specimen) for PCR, rapid antigen test. Aspirations/scrapings from skin showing haemorrhagic rash

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

+PHLS Meningococcal Reference Unit
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For further copies of this resource call Meningitis Research Foundation 01454 281811

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