PAEDIATRIC ACUTE CARE GUIDELINE	
Ventriculoperitoneal Shunt Problems	
Scope (Staff):	All Emergency Department Clinicians
Scope (Area):	Emergency Department

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Ventriculoperitoneal Shunt Problems

Ventriculoperiotonesal (VP) shunt complications include blockage and infection - early and prompt detection of shunt dysfunction is vital as delay can lead to markedly raised intracranial pressure, coning and death.

All patients with suspected VP shunt dysfunction should be discussed with neurosurgery.

Background

Ventriculoperitoneal (VP) shunts are inserted for treatment of hydrocephalus. Hydrocephalus is **not** a single disease entity. It is either due to subnormal CSF re-absorption, obstruction along the flow pathways or very rarely increased production. It may be:

- Congenital (e.g. myelomeningocele, Dandy Walker syndrome, stenosis of the aqueduct of Sylvius)

or

- Acquired (e.g. post meningitis, post hemorrhagic, obstruction due to tumour)

Treatment options include:

- Insertion of a CSF temporary diversion shunt (External ventricular drain) or permanent diversion shunt (VP shunt) - the main treatment modality
- Endoscopic third ventriculostomy (internal diversion via perforating the floor of the third

ventricle allowing CSF to flow from the 3rd ventricle directly to the cortical subarachnoid space)

Assessment

The following signs suggest a dangerously elevated intracranial pressure which constitutes a neurosurgical emergency:

- Impaired or falling Glasgow Coma Scale
- Bradycardia
- Hypertension
- Papilloedema
- Sun setting eyes

    - **Immediate mandatory referral** to the on-call Neurosurgery team via switch
        - If, in the event of such an emergency, there is an issue in obtaining the Neurosurgery team, contact the on call Neurosurgery Consultant for advice

History

- Parents may know the usual symptoms for their child in the event of a shunt blockage. Do not ignore the concerns of the child's parents or carers, particularly if they have had shunt dysfunction in the past.

History and symptoms may be variable:

- Drowsiness
- Headache
- Vomiting
- Irritability

The presence of drowsiness, headache and vomiting together make it very likely that the patient has shunt dysfunction.

Less commonly:

- Seizures
- Any new neurological symptoms
- Abdominal problem (tenderness, distension or peritonism)
- Fever (suggestive of shunt infecton)
- Lethargy

Intermittent shunt dysfunction/blockage or low pressure may lead to a more protracted time

course with chronic headaches.

Always suspect shunt dysfunction in any patient with a VP shunt **and** no alternative explanation for the presenting symptoms.

Examination

- Shunt evaluation (pressing the valve) is diagnostically unreliable and can potentially cause shunt dysfunction. Any abnormal shunt findings should be discussed with the Neurosurgical team.
- Examine for new focal neurological signs
- Examine for conscious state, pupillary size/reactivity, papilloedema
- In a child with an open fontanelle, this should be soft and pulsatile
- A sunken fontanelle may be due to low pressure
- Fluid tracking along subcutaneous shunt tubing may indicate shunt blockage
- Erythema, tenderness along shunt tubing and fever suggest infection
- Examine shunt surgical wounds if implanted

Investigations

Investigations that aid in diagnosis are:

- Brain CT – to detect ventricular size
    - Enlarged ventricles may imply shunt obstruction
    - A scan showing obviously dilated ventricles when **compared** with previous scans is a definite indication of shunt blockage/hydrocephalus
    - A “normal” looking CT scan without a previous scan **does not** reliably exclude the diagnosis of a shunt blockage/hydrocephalus (as in slit ventricle syndrome)

- Plain X-Ray / Shunt series – may demonstrate a disconnection
- CSF Sampling – this should only to be done by the neurosurgical team or after consultation with neurosurgery
- FBC and CRP may help in elucidating infection/ shunt dysfunction

Differential diagnoses

- In any unwell child with a VP shunt, shunt dysfunction must be a differential and not excluded until proven otherwise – **early consultation** with the Neurosurgical team is advised if suspected

Management

- Maintain a low threshold for contacting the Neurosurgery team for advice
- If blocked or infected, the shunt will require revision/removal – urgent consultation with the neurosurgical team is required
- In the event that **coning** is imminent and/or neurosurgical intervention will be delayed, steps should be instituted to maintain/restore cerebral perfusion pressure. This may include:
    - Reducing brain bulk and cerebral blood volume:
        - Anaesthesia
        - Intubation
        - Hyperventilation (ETCO2 28-32)
        - 20% Mannitol intravenous bolus 0.5 grams-1/kg (2.5-5mls/kg) over 20 minutes
        - or 3% NaCl (3ml/kg)slow IV push
        - Needling of the shunt and removal of CSF (should always be done by someone who is familiar with the procedure or under guidance from neurosurgery)
        - Increasing cerebral perfusion pressure using inotropes such as a noradrenaline infusion

Advice on this support can be provided by contacting the PICU.

Child with CSF shunt who presents unwell	
No signs and symptoms of raised intracranial pressure (ICP) or no new neurological findings	**Raised ICP or history comparable to a previous episode of blocked shunt**
• Consult with Neurosurgeon • Observe and investigate for other problems • Treat as appropriate	• If very unwell consult with Neurosurgeon and PICU immediately • Arrange CT head +/- shunt series X-Rays • **Minimum** of hourly observations: pulse rate, respiratory rate, blood pressure, neurological observations and continuous SpO2 monitoring • Discuss findings of CT scan with Neurosurgeon • Initiate treatment as prescribed by the Neurosurgeon

Observations

- Baseline observations heart rate, respiratory rate, blood pressure, $Sp0_2$, temperature and neurological observations
- Minimum of **hourly neurological observations** (including BP) along with general observations until definite diagnosis is made
- Any significant changes should be reported immediately to the medical team

Tags

abdominal, blockage, blocked, bradycardia, csf, ct, distension, drowsiness, dysfunction, fever, gcs, headache, hydrocephalus, icp, irritability, lethargy, neuro, neurosurgical, papilloedema, peritonism, seizures, shunt, tenderness, tummy, ventriculoperitoneal shunt, ventriculoperitoneal shunt problems, vomiting, vp, vp shunt

References

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2. Watkins L, Hayward R, Andar U, Harkness W. The diagnosis of blocked cerebrospinal fluid shunts: a prospective study of referral to a paediatric neurosurgical unit. Childs Nerv Syst 1994; 10:87-90

External Review

• Sharon Lee (PMH Neurosurgical Consultant): 13/3/2015

This document can be made available in alternative formats on request for a person with a disability.

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