EDENDALE HOSPITAL
DEPARTMENT OF MEDICINE

JUNE 2007

PROTOCOL:

MANAGEMENT OF PATIENTS REQUIRING LUMBAR PUNCTURE

Rationale:
This aim of this policy is to ensure the safe and consistent management of patients requiring lumbar puncture and cerebrospinal fluid (CSF) analysis.

Policy:
Medical patients requiring lumbar puncture should be managed according to the following procedures.

Procedure:

I. Identification of patients requiring lumbar puncture
Patients require lumbar puncture if two or more of the following features are present:

1. Headache
2. Fever
3. Neck stiffness
4. Altered mental status (delirium or confusional state)

OR: Persisting headache in HIV-infected patients with CD4 count <100 to rule out cryptococcal meningitis, after clinically excluding chronic sinusitis.

II. Contraindications to lumbar puncture
Lumbar puncture should not be performed if:

1. The patient is comatose and does not respond to voice or sternal rub (i.e. GCS <3/4; <5/6; <4/5)
2. Focal weakness is present (limbs or cranial nerves)
3. Papilloedema is identified by an experienced clinician

III. Management of patients who cannot have lumbar puncture
If lumbar puncture is needed but is contraindicated the following steps should be taken:

Prescribe ceftriaxone 2,0g IVI stat and dexamethasone 8 mg IVI stat, followed by ceftriaxone 2,0 g IV 12 hourly with dexamethasone 8 mg 8 hourly with IV fluids
Arrange CT scan within 24 hours – lumbar puncture can be performed if there is no midline shift, no mass lesions and the basal cisterns (3rd and 4th ventricles) are patent
IV. Lumbar puncture technique

1. Give morphine 10 - 15 mg IM 30 minutes before procedure if patient is anxious or restless
2. Position the patient in the left lateral position, with the spine fully flexed.
3. Locate the L4-5 or L5-S1 interspace, and mark the position over the interspinous ligament by gently indenting the skin with a pen-tip.
4. Sterile gloves should now be worn.
5. Clean the area with 10% povidone-iodine solution or 0.5% chlorhexidine solution in 70% alcohol, and infiltrate the skin with 1 ml 1-2% lignocaine (using an insulin syringe).
6. Insert the lumbar-puncture needle through the interspinous ligament into the subarachnoid space (identified by a 'flash-back' of CSF into the needle hub).
7. Immediately measure the CSF opening pressure using a disposable manometer, held vertically with the '0 cm' mark level with the needle.
8. Collect the CSF into three sterile white-topped tubes (labelled 1. 2. 3.):
   - 3 ml is sufficient for suspected bacterial meningitis;
   - 5 ml is required for the diagnosis of cryptococcal meningitis;
   - 10 ml is required for the tuberculous meningitis;
   - An additional 1 ml of CSF should be put into a grey-topped sodium fluoride tube, for glucose analysis.
9. Request chemistry, cell count, glucose, bacterial culture, cryptococcal agglutination test, India Ink stain, TB culture if TBM is suspected
10. Document capillary or plasma glucose immediately after procedure (for calculation of glucose ratio)

V. Interpretation of CSF results

The following Table is a guide to the interpretation of CSF results:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Cell count</th>
<th>Predominant cell type</th>
<th>Protein g/L</th>
<th>Glucose</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial</td>
<td>WBC 1000-5000</td>
<td>Neutrophils</td>
<td>1.0-2.5</td>
<td>Ratio &lt;0.5 or absolute &lt;1.9</td>
<td>Gram stain positive</td>
</tr>
<tr>
<td>Viral</td>
<td>WBC 50-1000</td>
<td>Lymphocytes</td>
<td>0.5 -2.0</td>
<td>Normal or slightly low</td>
<td>Herpes simplex PCR positive</td>
</tr>
<tr>
<td>Cryptococcal</td>
<td>0-100</td>
<td>Lymphocytes</td>
<td>Normal to raised</td>
<td>Normal or low</td>
<td>India Ink, CLAT and culture positive</td>
</tr>
<tr>
<td>Tuberculous</td>
<td>&gt;25</td>
<td>Lymphocytes</td>
<td>1.0-10</td>
<td>Ratio &lt;0.5 or absolute &lt;1.9</td>
<td>Culture + &lt;40% of cases</td>
</tr>
<tr>
<td>Para-meningeal</td>
<td>WBC 50-200</td>
<td>Lymphocytes neutrophils</td>
<td>normal</td>
<td>Normal</td>
<td>E.g. brain abscess</td>
</tr>
<tr>
<td>SAH*</td>
<td>RBC &gt;500</td>
<td>N/A</td>
<td>0.6 -1.5</td>
<td>Normal</td>
<td>Distinguish from traumatic</td>
</tr>
<tr>
<td>Normal</td>
<td>&lt;5</td>
<td>All lymphocytes</td>
<td>&lt;0.4</td>
<td>Ratio ≥0.5</td>
<td>Clear fluid</td>
</tr>
</tbody>
</table>
### Normal HIV

<table>
<thead>
<tr>
<th>Normal HIV</th>
<th>&lt;10</th>
<th>All lymphocytes</th>
<th>&lt;1.0</th>
<th>Ratio ≥0.5</th>
<th>Clear fluid</th>
</tr>
</thead>
</table>

#### Notes:

- CSF protein is frequently elevated to >2x normal in the setting of HIV infection associated with plasma hypergammaglobulinaemia

*Correction of WBC for RBCs

- Expected WBCs = \( \text{WBC in blood} \times \frac{\text{RBC in CSF}}{\text{RBC in blood}} \)

*CSF protein will increase for 1mg (.01g) / 1000 RBC

### V. Management of common causes of meningitis

1. Patients cannot be discharged from MOPD or the wards until the CSF analysis has been discussed with a senior clinician.
2. If a diagnosis is not made with certainty on the first lumbar puncture the doctor has an absolute responsibility to repeat the lumbar puncture within 24-48 hours determined by the clinical state of the patient.

#### Bacterial meningitis:

- Ceftriaxone 2,0 g 12 hourly 7-14 days, with dexamethasone 8 mg 8 hourly IVI (first dose given before antibiotic) 4 days

#### Cryptococcal meningitis:

- Amphotericin 1 mg/kg daily (unless admission Hb <9 g/dl in which case amphotericin dosing of 0.7 mg/kg is advisable) administered in 5% dextrose (see Amphotericin dilution policy) preceded by normal saline 1000 ml 12 hourly with 20 mg KCl in each bag to maintain hydration for 2 weeks. The patient’s haemoglobin should be checked twice weekly and U&Es thrice weekly whilst on amphotericin therapy.

- After discontinuation of intravenous amphotericin, the maintenance phase of treatment consists of fluconazole 400 mg daily for 8 weeks then 200 mg daily until CD4 >200 for 6 months. Please note that patients receiving concurrent rifampicin should receive fluconazole 600 mg daily for 8 weeks followed by fluconazole 400mg daily till CD4 >200 for six months due to drug interactions. ARV therapy should be expedited one month from the initial diagnosis of cryptococcal meningitis.

- Raised intracranial pressure protocol for cryptococcal meningitis patients

  The management of raised intracranial pressure is crucial to the management of cryptococcal meningitis. Raised intracranial pressure is a very common complication of cryptococcal meningitis. The identification and management of raised intracranial pressure in cryptococcal meningitis improves the clinical outcome of patients.

- Patients with reduced GCS or focal neurological signs require CT brain imaging to exclude mass lesions that may contraindicate lumbar puncture.

- **All patients** diagnosed with cryptococcal meningitis should have a baseline opening pressure (OP) measured on admission.

- If OP ≥ 25 cm H2O, lumbar drainage sufficient to achieve closing pressure ≤ 20 cm H2O or 50 % of initial opening pressure should be instituted.

- Lumbar drainage should be repeated daily until the opening pressure is stable.

- If, despite these measures, elevated pressure persists, lumbar drainage or ventriculoperitoneal shunting may be considered.
- Please note that adjunctive steroid therapy for the treatment of raised intracranial pressure is not recommended for HIV-infected patients.
- Likewise, there is no evidence that either acetazolamide or mannitol are beneficial in the setting of cryptococcal meningitis induced raised intracranial pressure.

(ICP protocol derived from Saag et al. ‘Practice guidelines for the management of cryptococcal disease’ CID 2000:30710-8)

Tuberculous meningitis:
- Rifafour/Rimstar according to weight with dexamethasone 8 mg tds for 7 days, then 6 mg tds for 7 days, then 4 mg tds for 7 days, then 2 mg tds for 7 days, then 2 mg bd for 28 days, decreasing by 1 mg per week. If oral dexamethasone is not available prednisone or dexamethasone can be substituted, at a starting dose of prednisone 80 mg bid or betamethasone 10 mg bid.

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[Cryptococcal meningitis protocol updated October 2007]

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