

# PAEDIATRIC INTENSIVE CARE – CLINICAL PRACTICE GUIDELINE

## **MENINGITIS**

### **1. Introduction**

Meningitis refers to an inflammatory process of the leptomeninges and CSF within the subarachnoid space. Infectious meningitis is broadly classified into:

- (i) Acute pyogenic (usually bacterial)
- (ii) Aseptic (usually viral)
- (iii) Chronic (many infectious agents) on the basis of the characteristics of inflammatory exudate on CSF examination and clinical evolution of the illness.

### **2. Parameters**

2.1 Target Population – 0 – 15 yrs)

2.2 Risk factors:

- ❖ Mechanical – CNS trauma, cochlear implants, ventricular shunt placement
- ❖ Medical – Immunodeficiency, asplenia, chronic renal disease, sickle cell disease

### **3. Definition**

**Lumbar puncture** – procedure in which cerebrospinal fluid (CSF) is withdrawn by means of a hollow needle inserted into the subarachnoid space in the region of the lower back (usually between the 3<sup>rd</sup> and 4<sup>th</sup> lumbar vertebrae). The CSF obtained is examined for diagnostic purposes.

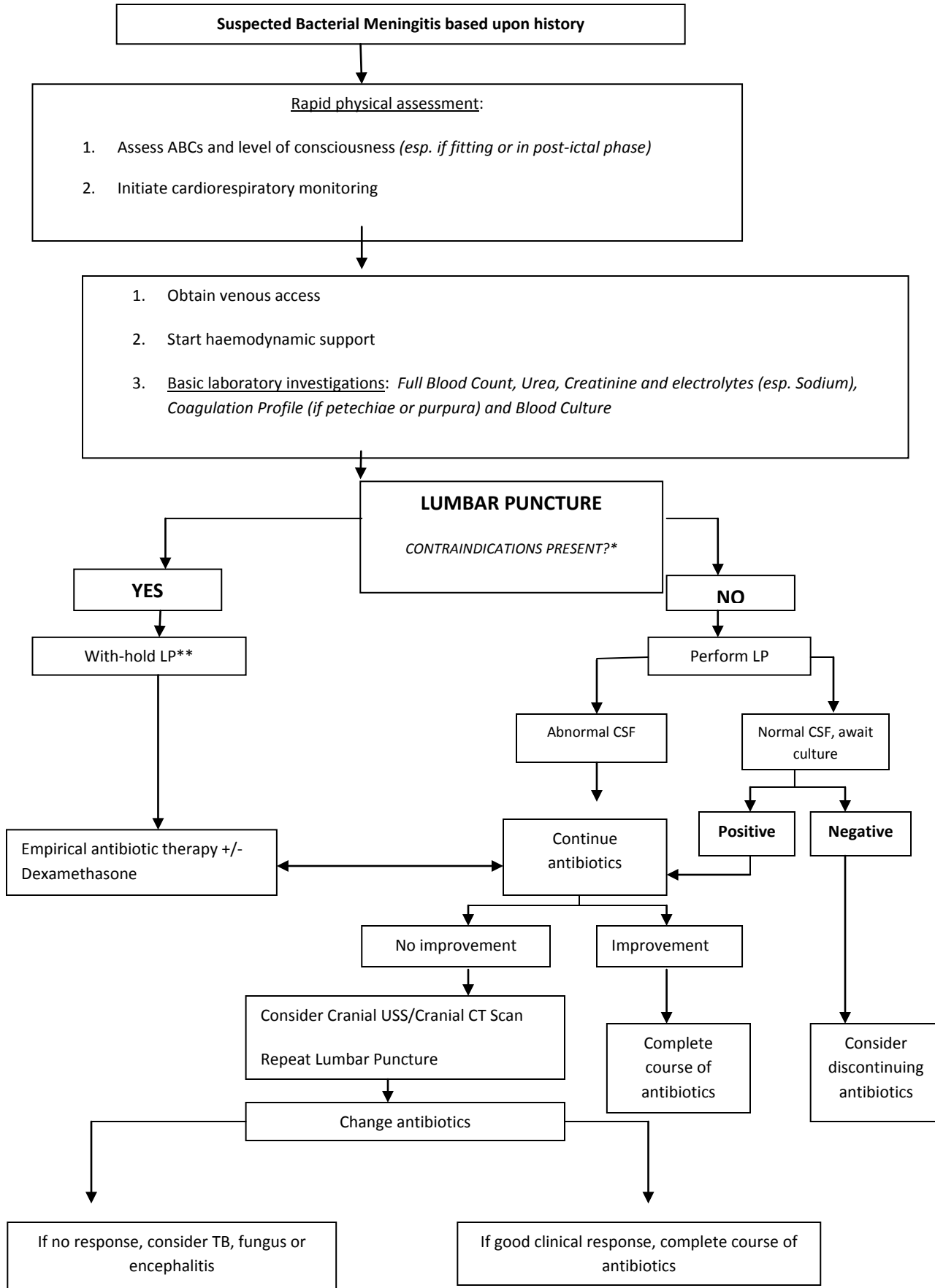
## ICP - Intracranial pressure - TABLE 1 Clinical Presentation

AGE	HISTORY	PHYSICAL EXAMINATION
<b>Neonate</b>	Poor feeding Irritability or lethargy Fever or hypothermia (temperature instability) Apnea or seizures Vomiting Maternal GBS colonization status & treatment <i>(Constitutional, non-specific signs)</i>	Bulging fontanelle Paradoxical irritability <sup>1</sup> High-pitched cry Vesicles <i>(suggest HSV infection)</i>
<b>Infant</b>	Seizures Fever	Neck stiffness Bulging fontanelle
<b>Older child</b>	Seizures Fever Changes in mental status (confusion/lethargy) Photophobia Rash <i>*Mechanical &amp; Medical factors</i>	Positive Kernig sign Positive Brudzinkski sign Papilloedema Exanthems <sup>2</sup> Joint involvement (GBS or meningococcal infection)

<sup>1</sup>Sign of meningeal irritation, especially in the young infant, whereby the infant who has meningitis does not wish to be handled, but prefers to remain motionless. Often, the parent has noted this behavior and refrains from holding or rocking the infant

<sup>2</sup>Exanthems typical for enterovirus, borreliosis (erythema migrans), and invasive meningococcal or pneumococcal disease (petechiae and purpura) may be present

# CHART 1 OUTLINE FOR MANAGEMENT OF MENINGITIS - ALGORITHM



\*Contraindications for performing Lumbar Puncture are as follows:

- ✓ Focal neurological signs
- ✓ Papilloedema
- ✓ Rapidly deteriorating consciousness or obtundation (Glasgow Coma Scale < 8)
- ✓ Signs of raised ICP (bradycardia, hypertension, dilated or poorly reacting pupils)
- ✓ Continuous seizure activity
- ✓ Bleeding diathesis
- ✓ Localised skin infection over lumbar-sacral region

\*\* At this point, if contraindications (increased ICP/coagulopathy/haemodynamic instability) may be corrected, then lumbar puncture may be performed

**TABLE 2 INTERPRETATIONS OF CSF VALUES IN NEUROLOGICAL DISEASE**

CONDITION	LEUCOCYTES (mm <sup>3</sup> )	PROTEIN (g/L)	GLUCOSE (mmol/L)	COMMENTS
<b>Acute bacterial meningitis</b>	100 - >50 000	1-5	< 0.5 – 1.5	Gram stain may be positive
<b>Partially treated meningitis</b>	1 – 10 000 usually ↑ PMN. May have lymphocytes	>1	Low	CSF may be sterile in pneumococcal, meningococcal meningitis
<b>Tuberculous meningitis</b>	10 – 500 early PMN, later lymphocytes	1 – 5	0 - 2.0	Smear for AFB, TB PCR positive in CSF. ESR ↑
<b>Fungal meningitis</b>	50 - 500 lymphocytes	0.5 -2	Normal/low	CSF for Indian ink/cryptococcal antigen
<b>Encephalitis</b>	10 – 1 000	Normal/0.5 -1	Normal	Send CSF for virology
<b>Encephalopathy</b>	<10 lymphocytes	Normal	Normal	May not be febrile

**Gram's** iodine stain (**Gram stain**) demonstrates bacteria in 60-90% of patients with bacterial meningitis who have not received prior antibiotics, and has a specificity >97%.

## Antibiotics

	Likely Organism	Empirical Antibiotic Regime	Duration of therapy
Neonates	Group B streptococcus, streptococcus faecalis, E.coli, proteus, K. pneumonia, Listeria monocytogenes	IV Ceftriaxone + IV Ampicillin	21 days (neonates)
Infants < 3 months old			14 days
Infant & Older Children	S.pneumoniae H.influenza N.meningitidis	Ceftriaxone Ceftriaxone Penicillin	14 days 10 days 7

In clinically suspected meningitis but not confirmed by CSF

- Neonates treat for 21 days
- < 3 months treat for 14 days
- > 3 months treat for 10 days

### Corticosteroids:

- Not indicated in < 3 months
- Dexamethasone 0.15mg/kg (max 10 mg) qid for 4 days
- Given prior to antibiotics. If missed before first dose of antibiotics, give within 4 hours
- Do not give after 12 hours of antibiotics

SUPPORTIVE CARE IN THE PATIENT WITH MENINGITIS	
1.	Best effect if steroid (Dexamethasone) is given before or with first antibiotic dose
2.	Monitor temperature, pulse, blood pressure, respiratory rate 4 hourly
3.	Fluid restriction not recommended for children with bacterial meningitis except in: <ul style="list-style-type: none"> <li>a) Evidence of increased ICP</li> <li>b) SIADH ( usually indicated by low serum sodium &lt; 130 mmol/L)</li> </ul>
4.	Daily head circumference to be measured (if fontanelle still open)
5.	Daily CNS assessment is essential (further seizures, focal neurological signs, decreasing GCS)

## CHEMOPROPHYLAXIS

	<i>Rifampicin</i>	<i>Alternatives</i>
<b>N. meningitidis</b>	10 mg/kg daily (neonate) 10 mg/kg max 600 mg 12 H For 2 days	Ciprofloxacin Child 12.5 mg/kg max 500 mg stat ➤ 12 year 500 mg stat Ceftriaxone Child 125 mg IMI stat >12 years 250 mg stat
<b>H.influenza</b>	10 mg /kg (neonate) 20 mg/kg max 600 mg daily For 4 days	

## Acute Complications

Monitor for development of the following:

- Subdural effusion
- Cerebral abscesses
- Acute hydrocephalus

Refer to surgeons immediately for further management

## Follow up

- 4 – 6 weeks after discharge
- Monitor for:
  - Hearing loss
  - Hydrocephalus
  - Seizure Disorders
  - Developmental Delay
  - Learning Disabilities

