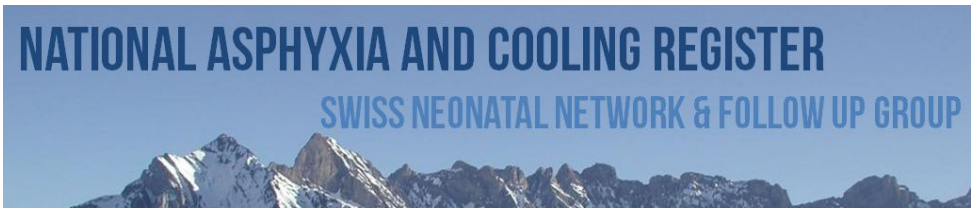

PROTOCOL NON COOLED INFANTS

Content

1. Patient group
2. Clinical management
3. Neuromonitoring
4. Neuroimaging
5. Other investigations
6. Follow-up assessment
7. Data collection

1. Patient group

Evaluate eligibility for hypothermia when resuscitation is completed and infant is stable. If hypothermia therapy is not indicated (see flow sheet “inclusion criterias”) however the infant shows mild neurological encephalopathy defined by Sarnat stage 1 or Thompson below 7, then the infant should be monitored as followed:

2. Clinical management

Normothermia should be maintained and hyperthermia should be avoided. Regular rectal temperature monitoring according to the local guidelines.

Otherwise routine clinical care for the infants can be done as usual and clinically indicated.

3. Neuromonitoring

a. Clinical neurological assessment

The infants should be neurologically examined on a daily basis using the Thompson Score (Thompson CM 1997) and filled in into the daily work flow sheet.

4. Neuroimaging

a. Cranial ultrasound and MRI

At least one cUS should be performed on admission or thereafter to exclude structural brain malformation, to document evidence of long standing or more recently established injury and to detect abnormalities characteristic of non-HIE causes of encephalopathy such as a hypoplastic corpus callosum suggesting diagnosis of non-ketotic hyperglycinaemia and germinolytic cysts suggesting mitochondrial or peroxisomal disorders or congenital infections. If the infant shows any unusual neurological signs, maybe a repeated ultrasound is warranted.

MRI as routine in mild encephalopathy is not indicated however if there is an unusual clinical course or seizures then it might be considered.

5. Other investigations

Investigations for metabolic or genetic disorders if unusual clinical neurological course, unusual pattern of injury on MRI scan and/or normal looking MR scan in face of ongoing neurological problems. Consider further investigations such as unblinding the result of the Guthrie Test, ammonia, repeat lactate, uric acids, amino acids, amino and organic acids (urine), urine for ketone and reducing substances, creatinine kinase and chromosomes.

Look for specific disorders such as sulfite oxidase deficiency, non-ketotic hyperglycinaemia, biotinidase deficiency, peroxisomal or mitochondrial disorders.

6. Follow-up assessment

Follow up according to unit's policy but at least, at the moment no planned Follow up within the register

7. Data Forms

a. Information leaflet should be given to the parents and signed parental consent should be aimed for

b. Daily work flow forms to be filled in either daily or in retrospect, data entry into database directly online

c. Posters with cooling criteria might be put on labour ward and the neonatal unit

Thompson Score				
Sign	**0**	**1**	**2**	**3**
Tone	Normal	Hypertone	Hypotone	Flaccid
LOC	Normal	Hyperalert, stare	Lethargic	Comatose
Fits	Normal	Infrequent <3/day	Frequent >2/day	
Posture	Normal	Fisting, cycling	Strong distal flexion	Decerebrate
Moro	Normal	Partial	Absent	
Grasp	Normal	Poor	Absent	
Suck	Normal	Poor	Absent/ bites	
Respiration	Normal	Hyperventilation	Brief apnoea	Apnoeic
Fontanel	Normal	Full, not tense	Tense	

Appendix 1. Thompson Score (Thompson, Puterman et al. 1997). LOC, level of consciousness

	Stage 1	Stage 2	Stage 3
Level of consciousness	Alert	Lethargic or obtunded	Stuporous
Neuromuscular Control			
Muscle tone	Normal	Mild hypotonia	Flaccid
Posture	Mild distal flexion	Strong distal flexion	Intermittent decerebration
Stretch reflexes	Overactive	Overactive	Decreased or absent
Segmental myoclonus	present	present	absent
Complex Reflexes			
Suck	Weak	Weak or absent	Absent
Moro	Strong;low threshold	Weak; high threshold	Absent
Oculovestibular	Normal	Overactive	Weak or absent
Tonic neck	slight	strong	absent
Autonomic function			
Pupils	Mydriasis	Miosis	Variable; unequal, poor light reflex
Heart Rate	Tachycardia	Bradycardia	Variable
Salivary Secretions	Sparse	Profuse	Variable
GI Motility	Normal or decreased	Increased; diarrhoe	variable
Seizures	none	common	uncommon

Appendix 2. Sarnat Score (Sarnat and Sarnat 1976)

References

de Vries, L. S. and L. Hellstrom-Westas (2005). "Role of cerebral function monitoring in the newborn." Arch Dis Child Fetal Neonatal Ed**90**(3): F201-207.

Eken, P., M. C. Toet, et al. (1995). "Predictive value of early neuroimaging, pulsed Doppler and neurophysiology in full term infants with hypoxic-ischaemic encephalopathy." Arch Dis Child Fetal Neonatal Ed**73**(2): F75-80.

Levene, M. I., A. C. Fenton, et al. (1989). "Severe birth asphyxia and abnormal cerebral blood-flow velocity." Dev Med Child Neurol**31**(4): 427-434.

Robertson, N. J., G. S. Kendall, et al. (2010). "Techniques for therapeutic hypothermia during transport and in hospital for perinatal asphyxial encephalopathy." Semin Fetal Neonatal Med**15**(5): 276-286.

Rutherford, M., L. A. Ramenghi, et al. (2010). "Assessment of brain tissue injury after moderate hypothermia in neonates with hypoxic-ischaemic encephalopathy: a nested substudy of a randomised controlled trial." Lancet Neurol**9**(1): 39-45.

Sarnat, H. B. and M. S. Sarnat (1976). "Neonatal encephalopathy following fetal distress. A clinical and electroencephalographic study." Arch Neurol**33**(10): 696-705.

Strohm, B. and D. Azzopardi (2010). "Temperature control during therapeutic moderate whole-body hypothermia for neonatal encephalopathy." Arch Dis Child Fetal Neonatal Ed**95**(5): F373-375.

Thayyil, S., M. Chandrasekaran, et al. (2010). "Cerebral magnetic resonance biomarkers in neonatal encephalopathy: a meta-analysis." Pediatrics**125**(2): e382-395.

Thompson, C. M., A. S. Puterman, et al. (1997). "The value of a scoring system for hypoxic ischaemic encephalopathy in predicting neurodevelopmental outcome." Acta Paediatr**86**(7): 757-761.

Thoresen, M., S. Satas, et al. (2001). "Twenty-four hours of mild hypothermia in unsedated newborn pigs starting after a severe global hypoxic-ischemic insult is not neuroprotective." Pediatr Res**50**(3): 405-411.