

Ischemic Perinatal Stroke
CHRCO Neonatal Intensive Care Nursery Guideline
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Background

Ischemic perinatal stroke (IPS) is a serious but under-recognized event, occurring in 1/4000 live births. IPS is defined as “a group of heterogeneous conditions in which there is focal disruption of cerebral blood flow secondary to arterial or cerebral venous thrombosis or embolization between 20 weeks of fetal life through the 28th postnatal day, confirmed by neuroimaging or neuropathology studies”. Approximately 15% of IPS occurs before term gestation. This condition has a relatively low mortality (3-10%) and low recurrence rates (3-5%), but there is significant modifiable morbidity. Hemiplegic cerebral palsy develops in about 30% of infants diagnosed in the newborn period. 83% of the arterial strokes involve the middle cerebral artery (MCA) distribution, with 2/3 involving the left MCA and 10% having bilateral distribution.

Predisposing Factors

- Maternal
 - Thrombotic hx, infertility
- Current pregnancy
 - First pregnancy, primiparity
 - Twin-twin pregnancy, FMH
 - Maternal hypertension/pre-eclampsia
 - Chorioamnionitis, maternal fever, PROM
 - Oligohydramnios
- Peripartum
 - Signs of fetal distress, intervention during delivery including emergent cesarean, birth trauma
- Neonatal
 - Male sex
 - LGA, IUGR
 - Polycythemia, hypoglycemia, meningitis, sepsis, DIC
 - Congenital heart defects
 - Need for vascular cannulation
 - ECMO

Symptom Complex

- Focal seizures
- Encephalopathy
- Apnea

Evaluation of Suspected Stroke

- Consult Neurology
- Request placental pathology at the birth hospital when possible to look for vasculo-placental pathology i.e. chorioamnionitis, thrombus, infarcted tissue
- Initiate evaluation and management of seizure as appropriate
- Continuous aEEG monitoring until video EEG is done
- Head ultrasound ASAP to evaluate for intracranial hemorrhage (≤ 24 hrs)
- MRI ASAP, when clinically stable (≤ 5 days)
 - Write Indication – *“Newborn with suspected stroke –MRI head, MRV head, MRA head*

- Consider repeat MRI in 5-7 days for all newborns with suspected cerebral sinovenous thrombosis (CSVT) on initial imaging
- Echocardiogram is not warranted unless there are cardiac signs or symptoms
- If maternal history of thrombotic events or multiple miscarriages, recommend to the OB that the mother be tested for antiphospholipid antibodies, lipoprotein (a), and factor V Leiden
- If maternal history concerning for possible drug use, obtain maternal and newborn tox screens
- Testing for thrombophilia in the acute setting of an isolated thrombotic stroke will not change management. Results are not reliable in the newborn period. However, if heparin treatment is being considered, an ATIII level and full hypercoag panel should be checked prior to starting therapy
- If family history of thrombophilia or thrombotic disorder then consider thrombophilia work up sooner (ATIII, ACA, lipoprotein (a), FVL)
- All patients should be referred to hematology outpatient clinic, to discuss implications of additional thrombophilia testing past the newborn period

Management

- Avoid dehydration: Establish appropriate vascular access and initiate intravenous fluids.
- Blood pressure/perfusion: Maintain cardiac output and normal blood pressure. Treat with volume/inotropes/pressors prn to attain MAP no lower than 50%ile age norms.
- Glucose: Initiate intravenous fluids with dextrose-containing solutions (D10W or TPN). Check chemstrips and maintain normal serum glucose levels.
- Temperature: Treat aggressively to prevent hyperthermia, and aim for temperature range 36^o-37^oC
- Oxygenation: Maintain goal oxygen saturation of 89-94%
- Ventilation: Maintain blood gas PCO2 goal 45-50 mmHg
- Consult PT/OT when the patient is clinically stable

Treatment Options

- In most cases, anticoagulation is not indicated. Anticoagulation using unfractionated or LMWH may be considered in selected neonates with progressive ischemic infarction *or*:
 - Clinical or radiological evidence of propagating cerebral sinovenous thrombosis despite supportive therapy
 - Intracardiac or intravascular thrombus considered at risk for embolization
 - Severe thrombophilic disorders
- Relative contraindications for anticoagulation
 - Hemorrhagic transformation of the infarct
 - MCA infarct greater than 50% of the MCA territory
 - Large cerebellar infarct
- Consult hematology if a newborn is being considered for anticoagulation
- Check AT III levels and baseline coagulation studies, with a PT/PTT/TT/fibrinogen, and d-dimers prior to starting heparin. Consider running FXa levels if standard heparin is utilized
- Treat seizures with anticonvulsant drugs

Outcome

The remarkably good outcome in many infants with IPS is likely to relate to cortical and subcortical plasticity and functional recovery.

- Hemiplegic cerebral palsy develops in about 30% of infants diagnosed in the newborn period
- Impairments in vision can occur in less than a 1/3 of the children by school age but these are unusual in the absence of hemiplegia
- Cognitive deficits present later at school age (6-11 years of age) in approximately 15-25% of IPS survivors
- Behavioral problems in about 10-25% of survivors

- Language/speech impairments, delayed acquisition of language
- Recurrence of seizures or epilepsy occurs in 25-50% of IPS survivors.
- If seizures outcome seems to be worse
- Background normalization on EEG is important for outcome

Follow-Up

- Neurology at age 3 months
- Hematology within the first year
- High Risk Infant Follow up
- Refer to local Regional Center or CCS MTU

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