新生兒窒息及缺血絕氧性腦病變 2002/01(制定)
ASPHYXIA AND HYPOXIC-ISCHEMIC ENCEPHALOPATHY 2007/01(審)

定義

當器官的氣體交換失敗時，就產生窒息。動脈氧氣濃度及 pH 值降低，二氧化碳濃度增加。

ACOG 1993

低 Apgar 分數(0-3)持續超過五分鐘
嚴重的酸血症 ($pH \leq 7.0$)
新生兒腦病變
全身性器官某種程度的傷害
→ 表示周產期的窒息嚴重到可能造成神經性的後遺症

鑑別診斷

母親使用藥物
代謝性疾病
遺傳性疾病
感染
結構異常
其他系統性疾病

腦部傷害的主要病理變化

Pattern	FT	PT	Pathogenesis
Selective neuronal necrosis	+	+	Regional vascular factors Regional metabolic factors Regional distribution of excitatory(glutamate) synapses
Status mamoratus	+	-	Regional distribution of excitatory synapses Relative sparing of nadph-diaphorase and dopaminergic neurons
Parasagittal cerebral injury	+	-	Parasagittal vascular anatomic factors Pressure-passive cerebral circulation
Periventricular leukomalacia	-	+	Periventricular vascular anatomic factors Pressure-passive circulation Intrinsic vulnerability of cerebral white matter of premature
Focal/multifocal injury	+	+	Focal and multipfocal cerebrovascular occlusion/insufficiency Generalized systemic circulatory insufficiency

足月嬰兒臨床表現：嚴重程度

Severity	Mild	Moderate	Severe
Level of consciousness	Increased irritability Hyperalertness	Lethargy	Stupor or coma
Seizures	-, jitteriness	Variable	+
Primitive reflexes	Exaggerated	Suppressed	Absent
Brain stem dysfunction	-	-	+
IICP	-	-	Variable
Duration	<24 h	>24 h	> 5 d
Poor outcome(%)	0	20-40	100

足月嬰兒臨床表現：嚴重者可能的進展過程

0-12 hours	Depressed level of consciousness-deep stupor or coma
	Ventilatory disturbance-“periodic breathing or respiratory failure
	Intact pupillary responses
	Intact oculomotor responses
	Hypotonia,minimal movement
	Seizures
12-24 hours	Apparent increase in level of alertness
	More seizures
	Apneic spells
	Jitteriness
	Weakness
	Proximal limbs, upper> lower(full term)
	Hemiparesis (full term)
	Lower limbs(preterm)
24-72 hours	Stupor or coma
	Respiratory arrest
	Brain stem oculomotor and pupillary disturbance
	Catastrophic deterioration with intraventricular hemorrhage (premature)
> 72 hours	Persistent, yet diminishing stupor
	Disturbed sucking, swallowing, gag, and tongue movement
	Hypotonia > hypertonia
	Weakness
	Proximal limbs, upper> lower(full term)
	Hemiparesis (full term)
	Lower limbs(preterm)

診斷

病史:母親的疾病，生產過程，胎兒監視器的變化，胎兒血液檢查，羊水中有胎便。

神經學檢查

代謝性變數：低血糖，低血鈣，酸血症，高血氨。

脊髓穿刺

腦波：可能的系列性變化

decreased amplitudes(suppression) and frequency

↓

periodic pattern and/or mutifocal or focal sharp activity

↓

periodic pattern with fewer bursts and more voltage suppression

↓

isoelectric

影像檢查：腦部超音波對於足月嬰兒的缺血絕氧性腦病變幫助有限

Neuropathological type	MRI	Technetium Scan	CT scans	Ultrasound
Selective necrosis	++	+	+	-
Status marmoratus	++	++	+	++
Parasagittal cerebral injury	++	++	+	-
Periventricular leukomalacia	++	+	+	++
Focal and multifocal brain injury	++	++	++	+

臨床表現及長期預後

Pattern	Neonatal period	Long-term sequelae
Selective neuronal necrosis	Stupor and coma Seizures Hypotonia Oculomotor disturbances Disturbed sucking, swallowing, and tongue movements	Mental retardation Spastic quadriparesis Seizures disorder Ataxia Bulbar and pseudobulbar palsy Hyperactivity and impaired attention Atonic quadriparesis
Status marmoratus	Unknown	Choreoathetosis Mental retardation Spastic quadriparesis
Parasagittal injury	Proximal limb weakness, upper > lower	Spastic quadriparesis Intellectual deficits
Periventricular leukomalacia	Probable lower limb weakness	Spastic diplegia Intellectual deficits
Focal and multifocal injury	Seizures, usually focal Hemiparesis and quadriparesis	Spastic hemiparesis and quadriparesis Cognitive deficits Seizures disorders

可能與預後不良有關的因素

胎心監視異常
胎兒血或臍帶血 pH 值低
Apgar 分數小於 3 分超過 5 分鐘以上
新生兒腦病變:時間超過五天，中至重度
影像檢查
--CT：focal or generalized decrease in tissue attenuation
--超音波：increased echogenicity
--MRI
腦波及誘發電位
腦血流檢查
--Doppler ultrasonography:increased or decreased blood flow velocity

--positron emission tomography
--其他：SPECT， near-infrared spectroscopy
生化上的異常
--magnetic resonance spectroscopy
--creatine kinase—bb， hypoxanthine，etc
治療
避免子宮內窒息
維持適當的換氣 Maintenance Of Adequate Ventilation
維持適當的血流灌注
維持適當的血糖濃度 75-100mg/dl
治療 SIADH
控制 Seizures
控制腦腫脹 Brain Swelling:避免水分過量,如有腦壓增高造成腦血流有問題或是有 herniation 的表徵，考慮治療腦腫脹
仍在發展中的治療方式
Excitatory amino acid antagonists
glutamate receptor antagonists(MK-801,ketamine, etc)
Calcium channel blocker
Oxygen free radical scavenger
Hypothermia
Magnesium:vasodilation, inhibition of the NMDA-receptor, anti-convulsive properties, block the activation of NO-synthase