# Treatment Hypothermic

Guidelines hypotheria in newborn with severe asphyxia

Dott. Giuseppe Bianco Clinica Villa Bianca Antalya 5-8/11/2015

- Perinatal hypoxic-ischaemic encephalopathy (EII) is a major causes of infant cerebral palsy (6-23%).
- The incidence of intrapartum asphyxia is about 3-4 /1000 live births.
- The incidence of EII, without preconceptional o antepartum abnormalities is about 1.6 /10000 live birth.
- L'EII moderate or severe has a mortality of between 10 and 60%;
- among the survivors 25% develop neurologic sequelae .

Cerebral Hypothermia guidelines

 Cooling the brain in neonates with hypoxic-ischemic
encephalopathy (EII) (Gluckman et al 2005, Shankaran et al 2005, Wyatt et al 2007)

 task force about cerebral hypothermia.

neurological outcome.

## Hypoxic-ischaemic encephalopathy

#### Prenatal causes

Maternal diabetes ;hypo and hypertension;anesthesia; eclampsia

Placental: detachment; infection Funicular: round cord ; true knot ; prolapse;ruptured cord.









## Pathogenetic mechanisms of hypothermia

The brain damage is not a single event but an evolutionary process that begins during the hypoxic-ischemic injury and, in severe cases and / or prolonged, continued in a subsequent period defined ' Reperfusion phase '.

Pathogenetic Mechanism of Hypothermia In the acute phase occurs direct neuronal necrosis resulting in cellular hypoxia with exhaustion of cellular energy metabolism (failure by primary energy).



Pathogenetic Mechanism of Hypothermia

Many neurons do not die during the first phase of damage but, paradoxically, after the re-oxygenation of the newborn, 6 to 100 hours after the hypoxic-ischemic damage.

# Mechanism pathogenetic of hypothermia

# It consists mostly of neuronal death by apoptosis,

a process of cellular distruction that can take several days (programmed death)



#### Direct neuronal death



#### Apoptosis

Electron microscopy

## Hypoxic-ischaemic encephalopathy

#### 2 physiopathologically important moments

#### anaérobic metabolism

#### energy production

lattate accumulation

6 hours later

- 2 (reperfusion phase)
- Production of free radicals oxygen
- inflammation
- Loss autoregulation of cerebral blood flow

APOPTOSIS

#### Primary neuronal insult

**NECROSIS** 

Insult secondary neuronal

Hypothermia guidelines New opportunties can fit in the range below the resuscitation of asphyxiated newborn before the secondary phase of the energy metabolic damage is taking place.



## **BRAIN COOLING**

vasogenic edema

Release of excitatory neurotransmitters

Free radicals of O<sub>2</sub>

Activation of cytokines

Brain metabolism

## HYPOTHERMIA GUIDELINES

 Recommendations for newborn care with hypoxic-ischemic encephalopathy (SIN)

> possible candidate for the hypothermic treatment

## NEWBORN with GA > 35 W weight > 1800 gr

#### **INCLUSION CRITERIA**

## criterion A e B:

### A. intrapartum hypoxia : Apgar < 5 at 10 ' of life or 2) newborn that needs resuscitation with ET tube or mask and Ambu for 10' minutes of life or 3) fetal acidosis o neonatal with pH < 7.0 or BE > 12 mmol/l from EGA of the first 60' of life

the EGA must be executed as soon as possible, from umbilical artery With more EGA in the first 60' of life , consider that with values more pathological .



## Fetal-placental circulation



Hypoxic-ischaemic encephalopathy Criterion **B** moderate or severe Hypoxicischaemic encephalopathy with Sarnat & Sarnat score about 30' - 60' of life (II – III stage).

## SARNAT STAGE

Sarnat 1: Iperallerta , tone and motility normal , normal or Moro exaggerated , pupils with normal reaction

Sarnat 2: Lethargy, reduced motility, hypotonia, primitive reflexes reduced (eg.understanding, sucking), miosis, bradycardia, breathing periodic

Sarnat 3: Stupor or coma, decerebrate posture, hypertonic extensor limb, spontaneous motility absent, flaccidity, reflections absent, or areattività pupillary mydriasis, apnea

> It takes at least 3 to classify abnormalities a baby in a specific stage of Sarnat

## PROTOCOLLO DELL'IPOTERMIA

## **Exclusion Criteria**

#### Babies with more than 6 hours of life

#### **Serious birth defects**

## GUIDELINES HYPOTHERMIA The therapy is effective if started within the first 6 hours of life .

For the complexity of the level of care required , the hypothermic treatment should be carried out only in neonatal intensive care units



## delivery room

neonatal isle respirator (Neo-puff) umbilical catheters Set for intubation Blood gas analyzer Staff informed and trained









## Check-list e tasks of the center of 1° and 2° level

- Evaluation indices suffering
- EGA within 1 hour of life
- Evaluation parameters eligibility beginning hypothermia
- Off bed resuscitation
- Rectal temperature measurement (35°C)
- inform staff
- stabilization
- transport according specific arrangements



## NEONATAL TRANSPORT



## **GUIDELINES HYPOTHERMIA**

#### TR 35°C

Monitoring with deep rectal

Every 15 minutes

Each °C HR < 14 pulse / min

Increase of 0.5-1  $^{\circ}$  C if HR < 80 / min

## waiting for the Transport

### respiratory, cardiovascular and metabolic stabilization before transfer.



# AWAITING THE STEN Sedative / antiepileptic therapy

#### <10 mcrV >5 mcrV normal pattern

>10 mcrV < 5 mcrV abnormal pattern





## Convulsive electrical activity



10-40 mcrV

# NICU

*Selective hypothermia rectal temperature* 34-35 °C

*Sistemic hypothermia* rectal temperature 33-34 °C.



severely abnormal pattern

# **Baby-cooling**



Selective hypothermia (With hat)



# Baby cooling



### systemic hypothermia









mattress

#### **PERINATAL HYPOXIA**









# **GUIDELINES** Hypothermia

Assistance during hypothermia

- minimal handling
- Place central catheter
- sedation and analgesia
- ventilatory support
- Dx > 47mg/dl PA media >40 mmHg
- fluid management
- And electrolytes (risk of hyperkalemia)
- antibiotics

## HYPOTHERMIA

Ictus ischemico acuto
Arresto cardiaco in età pediatrica
Trauma cranico
Stroke ischemico
"near miss event"
NEC (necrotizing enterocolitis)

## **GUIDELINES** Hypothermia

#### Dott. Giuseppe Bianco



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