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Care of baby under therapeutic hypothermia

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Abstract
Therapeutic Hypothermia has proven neuroprotective effects in global cerebral ischemia. Indications for hypothermia induction include cardiac arrest and neonatal asphyxia. The two general methods of induced hypothermia are either surface cooling or endovascular cooling. The therapeutic effects of hypothermia were discussed as early as 400 BC when Hippocrates mentions the use of snow and ice to reduce haemorrhage in patients. Therapeutic hypothermia has also been used in head-injured patients for the control of increased intracranial pressure that is refractory to hyperventilation, osmotherapy, ventricular drainage and barbiturates. Therapeutic hypothermia involves the controlled reduction of core temperature to attenuate the secondary organ damage which occurs following a primary injury. Therapeutic hypothermia is a treatment that lowers a new-born's body temperature in order to prevent or minimize brain damage caused by lack of oxygen or another injury before or during birth.

Keywords: Hypothermia, therapeutic hypothermia, cardiac arrest, cerebral ischemia, surface cooling, endovascular cooling, hyperventilation, osmotherapy, ventricular drainage

Introduction

Neonatal Therapeutic Hypothermia

Neonatal therapeutic hypothermia is intended to improve long-term neurological outcome for patients who would otherwise have no available options beyond life-supportive care. The entire treatment takes approximately 72 hours [1].

Criteria for Therapeutic Hypothermia [2]

1. ≥ 35 weeks gestational age and more than 1.8kgs.
2. < 6hrs. post birth.
3. Evidence of asphyxia as defined by the presence of at least two of the following four criteria.

- Apgar ≤5 at 10 minutes or continued need for resuscitation with positive pressure ventilation +/- chest compressions at 10 minutes of age
- Any acute perinatal event that may result in HIE (i.e. abruption placenta, cord prolapse, severe fetal heart rate abnormality).
- Cord pH <7.0 or base deficit of 12 or more within 60 minutes of birth
- If cord pH is not available, arterial pH <7.0 or BE >12 mmol/L within 60 minutes of birth (If Available).

4. Assessment of relative contraindications with plans for full care. For example: Uncontrolled pulmonary hypertension, uncontrolled clinical coagulopathy (i.e. active bleeding), and major congenital abnormalities.
5. Clinically defined moderate or severe HIE

Mira Cradle

It is a passive cooling device which uses saver Phase Change Material (PCM) technology to induce therapeutic hypothermia among newborns suffering from birth asphyxia [3].

Compost on of Mira Cradle [4]

Composed of a rotomolded plastic structure and a conduction mattress, MiraCradle is one of its kind insulated cradles. Coordination and functioning between the layers of the device.

The device regulates temperature through 3 layers of thermal interface material. Namely

- Gel Conduction Mattress Bed.
- Save FS-29 and.
- Save FS-21.
- Save FS-29.

Specifications of Miracradle [4]

- Easy to use, light-weight and portable.
- Safe and precise temperature control For 33-34.5°C over a period of 72 hours.
- Three units of save fs-29 PCM placed at the bottom of the cradle.
- No requirement of a constant electricity supply.

Nursing Care under Therpeutc Hypotherma [5]

1. Monitoring

❖ Continuously monitor and record hourly

- Heart rate.
- Respiratory rate.
- Oxygen Saturations.
- Invasive blood pressure.
- Surface temperature from cooling machine surface probe.
- Core temperature-from cooling machine rectal probe.
- Set temperature- from cooling machine.

❖ Urine output should be measured 6 hourly as renal function can be compromised.

❖ The rectal probe can be left insitu for the full time period of cooling and re-warming. It does not need to be removed and routinely cleaned during this time. The average heart rate for a cooled baby is 100.

❖ The standard parameters for heart rate and respiratory rate alarm settings should be altered according to the status of each baby.

❖ The baby should have a pain score assessed and recorded hourly, due to the high probability of pain or discomfort.

2. General Care

- If baby is receiving respiratory support, the heating and humidification levels should be set to their 'normal' settings.
- Respiratory secretions tend to be sticky when a patient is cold.
- When doing blood gases, the actual temperature of the baby should be inputted into the gas machine, allowing the blood gas to be corrected for temperature.
- Hypothermia can affect coagulatory function, so staff should be vigilant for signs of bleeding such as bruising, excessive bleeding after heel-prick or veni-puncture and petechiae.
- It is usual practice for cooled and ventilated babies to be sedated with intravenous morphine.
- If you feel the baby is distressed or in pain, inform the nurse in charge, or the medical team.

3. Skin Integrity

- Open the cooling jacket and assess the baby's skin, taking particular note of areas over the bony prominences, such as buttocks and spine.
- Reposition the baby, so that the areas of skin under maximum pressure are altered.
- Nursing the baby in the midline position does not require that they always be positioned supine.

4. Seizures

- Cooled babies should be observed closely for signs of clinical seizures, which may include.
- Lip smacking.
- Jerking movements of one or more limb.
- Back arching.
- Facial twitching.
- Eye rolling.
- Cycling of limbs.
- Excessive hiccoughing.
- The nature of seizures and length of time of each episode spans should be documented in the nursing record as well as marked on the Cerebral Functioning Montorng.
- Report all episodes of clinical seizures to the medical team and treat as local policy directs.

5. Documentation

- It is usual practice to document these values every hour
- Heart rate.
- Respiratory rate.
- Oxygen Saturations.
- Invasive blood pressure.
- Surface temperature from cooling machine surface probe.
- Core temperature-from cooling machine rectal probe.
- Set temperature- from cooling machine.

6. Rewarming

- Rewarming will usually begin after 72 hours of cooling, unless the decision to cease cooling is made earlier.
- Follow the NICU local medical guideline for rate and time interval of rewarming, usually 0.2-0.5°C.
- The risk of seizures is higher during and after rewarming, so the babies should be vigilantly monitored during this period.
- If complications (seizures or hypotension) occur, inform medical staff and reduce the temperature back down to the temperature at which the baby was previously stable. Further rewarming may need to be done more slowly.

7. Parents

- Verbal Parental assent is required for cooling. This will be taken by the medical team, and recorded in the baby's medical notes.
- Keep parents informed about all aspects of their baby's care and encourage them to participate in their care, as appropriate.
- Separation of the baby and mother/father is a significant issue when a term baby is unexpectedly admitted to the neonatal unit for cooling. This is exacerbated if the baby requires transfer to a tertiary centre for cooling, and the baby ends up in another hospital. Every effort should be made to.
- Keep parents informed.
- Encourage parental visiting and involvement.
- Facilitate positive touch/ cuddles aspossible/ appropriate

Conclusion

Therapeutic hypothermia is a treatment that lowers a newborn's body temperature in order to prevent or minimize brain damage caused by lack of oxygen or another injury before or during birth. Therapeutic hypothermia aims to lower the temperature of the vulnerable deep brain structure

to 33-34℃. Hypothermia is not without risk and thus it is important to manage the patient safety during induction and maintenance of hypothermia and during the rewarming process.

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