

勵翔獎科學論壇

入選者

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Original Article

Therapeutic hypothermia for pediatric refractory status epilepticus May Ameliorate post-status epilepticus epilepsy

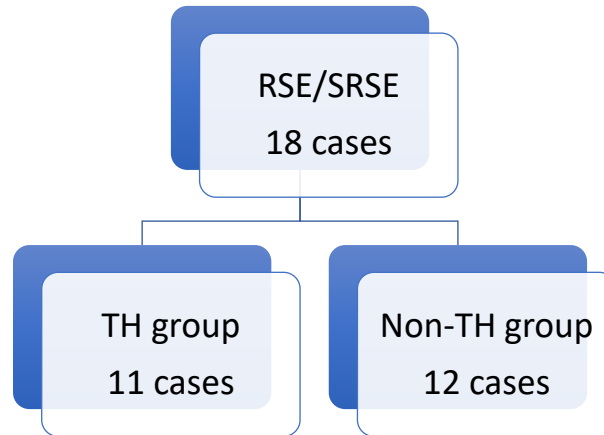


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Methods

- We reviewed the medical records of all patients with RSE/SRSE who were admitted to the Pediatric Intensive Care Unit (PICU) of the Department of Pediatrics at two medical referral centers,
 - Taoyuan Chang Gung Children's hospital
 - Kaohsiung Chang Gung Memorial Hospitalbetween January 2014 and December 2017
- We collected clinical data with diagnosis of RSE/SRSE

Methods

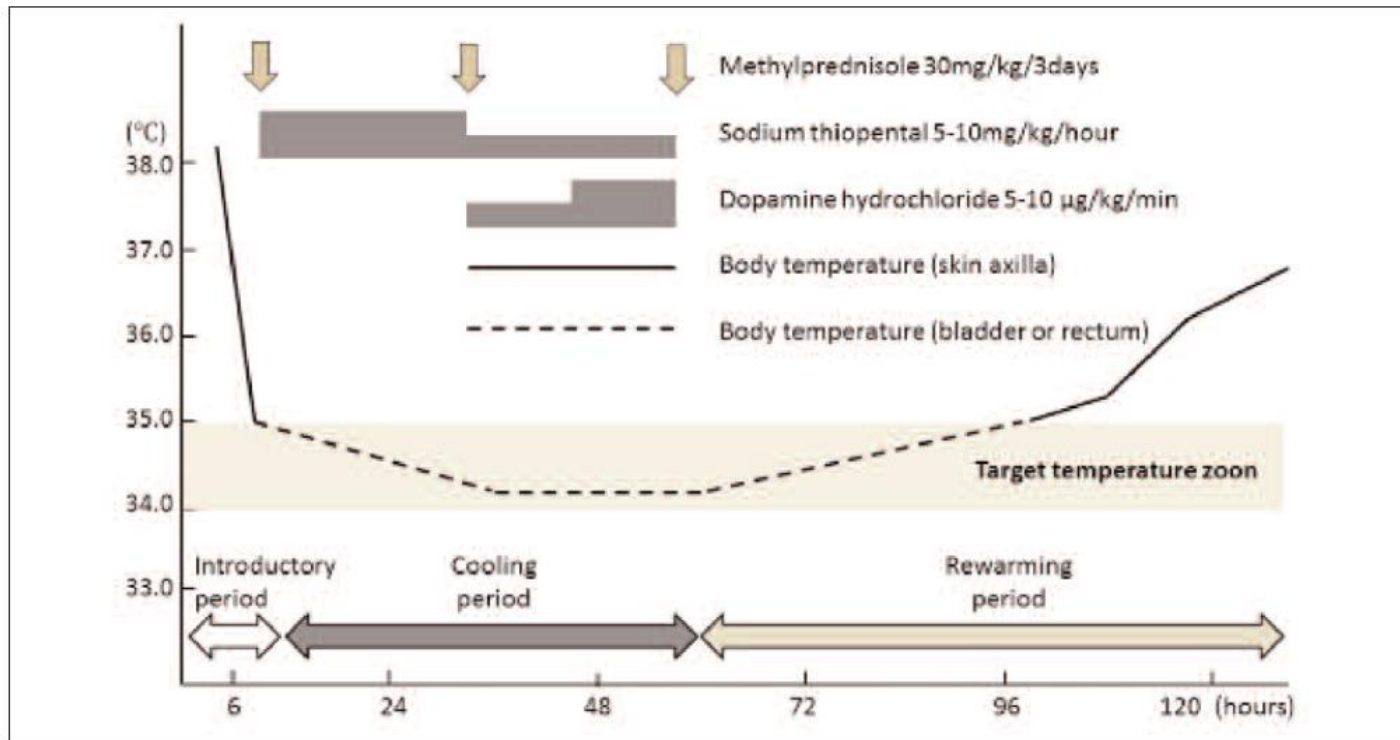


GOS 1	Good recovery
GOS 2	Moderate disability (disabled but independent), no assistance with activities of daily living
GOS 3	Severe disability (conscious but disabled), needing assistance with activities of daily living
GOS 4	Persistent vegetative state
GOS 5	Death

GOS = Glasgow outcome scale

- Age /sex
- PICU stay
- RSE/SRSE duration
- kinds of AEDs use
- 6 mo Outcome (GOS outcome scale)

Brain hypothermia therapy



Imataka G, et al. Eur Rev Med Pharmacol Sci. 2014

Our protocol

This protocol applies for patients with status epilepticus or suspicion of acute encephalitis / encephalopathy

1. Admission to PICU with intensive critical care
2. Assure the patient has the following supportive equipment before hypothermia therapy:
 - a. Endotracheal intubation (RSI, Rapid Sequence Intubation) with artificial ventilation to keep PCO₂ at 35 to 40 mmHg (do not over-ventilate).
 - b. If possible, set up arterial catheter to monitor arterial pressure
 - c. If possible, set up CVP catheter to assess fluid volume. Goal CVP 6-10 mmHg
3. Assess the patient's clinical status before initiating hypothermia therapy
 - a. Obtain continuous core temperature via esophageal probe
 - b. Assess baseline 12 Lead EKG
 - c. Check ABG, CBC/DC, PT/APTT, Fibrinogen, D-Dimer, BUN/Cr, Na/K/Ca/Cl/P/Mg, AST, Bil (T/D), albumin, CRP, lactate, amylase, lipase, cardiac enzyme, CPK isoenzyme
4. Sedate patient with midazolam continuous infusion [2-20mcg/kg/min] and anti-shivering drug as Rocuronium [6-12mcg/kg/min].

5. Intracranial pressure is controlled by the followings:
 - a. Fluid infusion between 80 and 100 ml/kg/day. Fluid control must not be reduced more than necessary in order to maintain blood pressure and cerebral circulation.
 - b. Maintain head of bed at 30 degrees.
 - c. Submitted hypertonic 3% NaCl
6. Steroid pulse therapy: methylprednisolone 30 mg/kg over three hours for three days
7. Administer esomeprazole or other PPI drugs to prevent stress ulcer.

8. Cooling phase:

- a. Brain hypothermia therapy uses Arctic Sun cooling system, to induce target body temperature (direct esophageal temperature 34.0 to 35.0 degrees) within three hours of onset.
- b. Anti-seizure medication: midazolam, 2 to 20 mcg/kg/min or Thiamylal Sodium, 2-5 mg/kg/hr.
- c. Sedation depth should be confirmed by portable electroencephalograph (Nicolet) as reaching suppression burst within six hours of beginning therapy.

9. Cooling period:

- a. Target temperature to be maintained for 48 hours (or maximum 72 hours).
- b. Patients achieving a positive sedation depth should reduce the anti-seizure medication dose prior to rewarming
- c. [Caution] If spikes remain with suppression bursts, consider complete suppression
- d. Manage electrolyte abnormalities and blood glucose.
- e. Administer antibiotics appropriate.

10. Rewarming period

- a. Rewarming is implemented at a pace of 0.05 degrees per hour.
- b. When the body temperature backs up to 36.0 degrees, we will keep body temperature at 36.0 degrees for 24 hours to prevent rebounding IICP.



Results

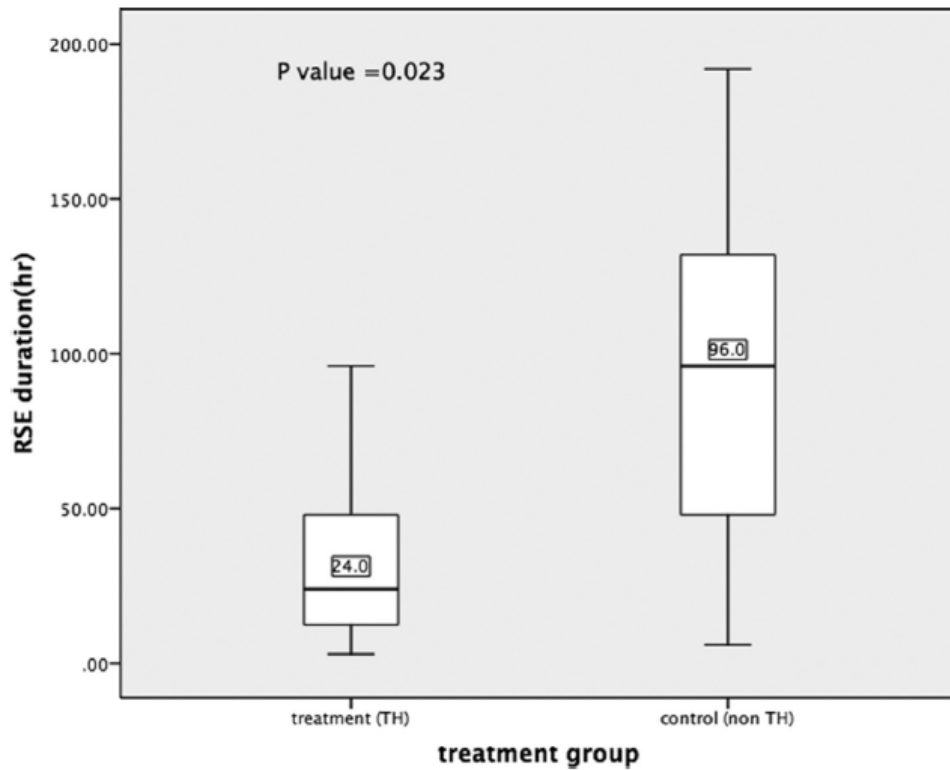
Patient data

Table 1 Clinical information of patients underwent therapeutic hypothermia.

	Age at onset/Sex	Etiology for SE	TH Target temp (°C)	TH Duration (hrs)	Complications of TH
Patient A	13yo/M	FIRES	35	72	Electrolyte imbalance, Bradycardia
Patient B	13yo/M	FIRES	34.5	72	Bradycardia, Infection
Patient C	8yo/M	Dravet syndrome	35	48	Electrolyte imbalance, Infection
Patient D	8 mo/M	TBI post minor neurosurgery	34	72	Electrolyte imbalance
Patient E	6 mo/M	TBI post minor neurosurgery	34	72	Electrolyte imbalance, Coagulopathy
Patient F	2 mo/M	TBI post minor neurosurgery	35	48	Electrolyte imbalance, Coagulopathy
Patient G	8yo/M	FIRES	34	120	Electrolyte imbalance
Patient H	4yo/M	FIRES	35	72	Electrolyte imbalance
Patient I	6yo/F	FIRES	35	48	Electrolyte imbalance
Patient J	6yo/F	FIRES	35	48	Electrolyte imbalance
Patient K	10yo/M	FIRES	33	120	Electrolyte imbalance, Tachycardia

Table 2 Outcome measurement between treatment-and control-group.

	Treatment Group (n = 11)	Control group (n = 12)	p value
Age (yrs; median (IQR))	6.5(9.8)	9(6.25)	0.30
Sex (M/F)	9/2	7/5	0.092
RSE duration (hrs; median (IQR))	24(40)	96(90)	0.023*
ICU stay (days; median (IQR))	30(42)	30.5(30.25)	0.666
AEDs kinds (median (IQR))	5(3)	3(1.5)	0.086
GOS score (median (IQR))	4(2)	3(0.75)	0.01*
Chronic Epilepsy	5(45)	12(100)	0.005**



TH group showed significantly shorter RSE durations

Results

RSE duration

- TH had significantly shorter RSE duration

AEDs kinds

- **No significant difference**

Length of ICU stay

- No significant difference

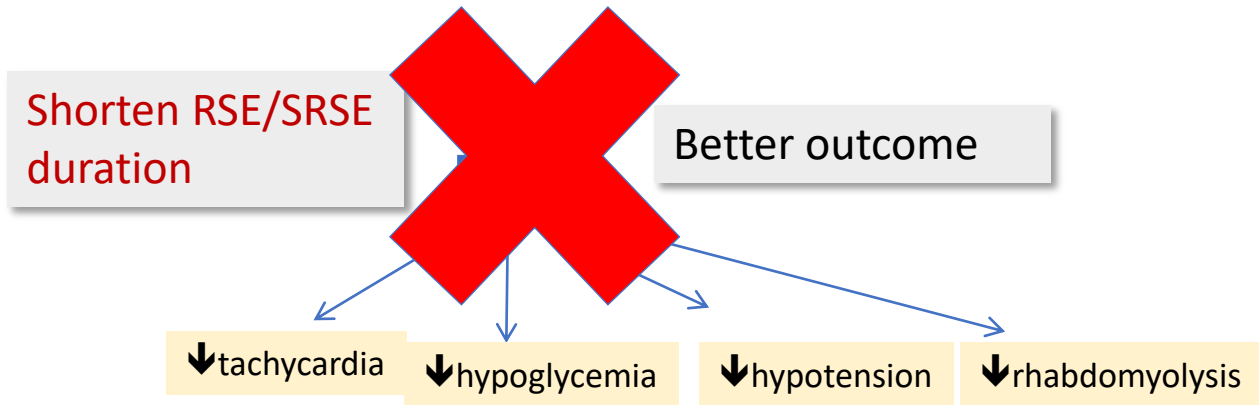
Outcome measurement

- no significant difference



Discussions

本團隊發現



- The etiology for RSE/SRSE was the pivotal predictor for RSE/SRSE outcome

低溫治療的壞處?!



E imbalance

Bradycardia

Infection

Coagulopathy

- The complications during and after TH were **all transient and manageable** during ICU routine care.
- The electrolytes abnormalities were our major complications.

Conclusions

- Therapeutic hypothermia by cooling blanket is effective in **shorten seizure duration** during pediatric RSE/SRSE in our study.
- There were less unmanagable complications during therapeutic hypothermia.

有效縮短抽搐時間
併發症少

Conclusions

- It seemed safety in the use of pediatric RSE/SRSE group.
- Further prospective study of pediatric RSE/SRSE underwent therapeutic hypothermia with suitable controlled cases were needed to have more persuasive results.

低溫療法在兒童安全
未來需提供更多的研究佐證