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ID 1019

# Endovascular cooling for hypothermia after severe hemispheric stroke:

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**BACKGROUND** The prognosis of massive hemispheric infarction is poor with a mortality rate of 70-80%. There is no evidence that conventional antiedema therapy improves clinical outcome or mortality. Therefore, more aggressive therapy approaches are needed. Hypothermia may represent a promising option. We here report our [illegible] moderate hypothermia in patients with space-

## PATIENTS AND METHODS

From 2002 until 2006, 35 patients with severe acute ischemic stroke were treated with prolonged moderate hypothermia according to our instituional protocol.

**Inclusion criteria**

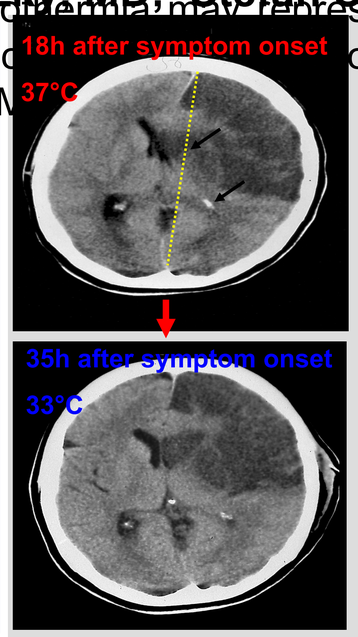
- ►Acute MCA infarction involving >2/3 of the MCA territory on CT or MRI
- ►National Institute of health Stroke Scale (NIHSS) > 15
- ►Decreasing level of consciousness
- ►Signs of local brain swelling or midline shift on CT or MRI

**Induction of hypothermia**

- Hypothermia was induced as soon as possible using an 8.5F 35-cm catheter (ICY, Alsius Corporation, Fig. 1a and b). This catheter consists of an additional lumen, which ends in 3 balloons sized 8x5x5 mm. These balloons are perfused with a sterile infusion of saline via a closed-loop tubing system which is connected to a temperature management device.
- Target temperature 33C°
- Duration of hypothermia >72 h
- Active rewarming with maximal rate of 0.1°C/h

**General Critical Care**

- ICP-Monitoring with intraparenchymatous sensors (CODMAN) ipsilateral to the lesion
- Midazolam for sedation, fentanyl for analgesia, atracurium for neuromuscular blockade
- Body temperature monitoring with catheter inserted in the bladder
- Cerebral perfusion pressure >70mmHg, ICP <20mmHg
- Mechanical ventilation in a pressure controlled mode



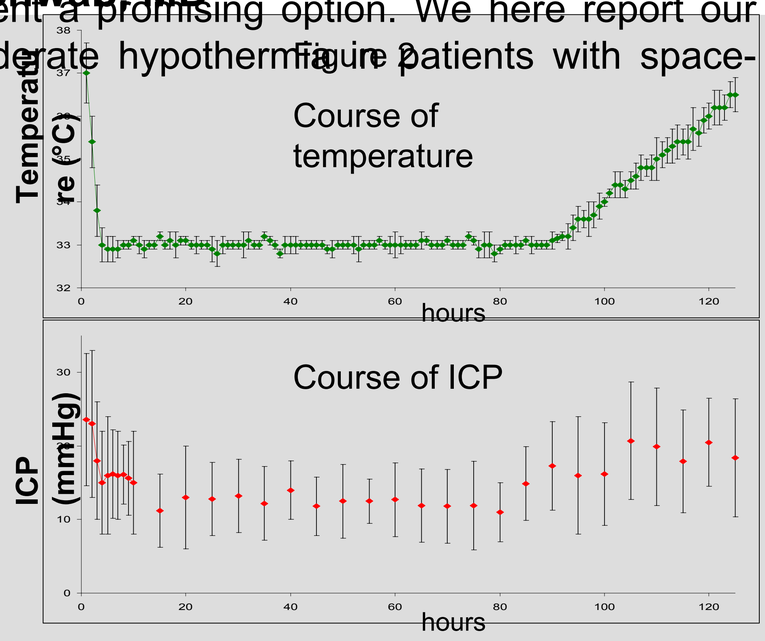




Figure 1a

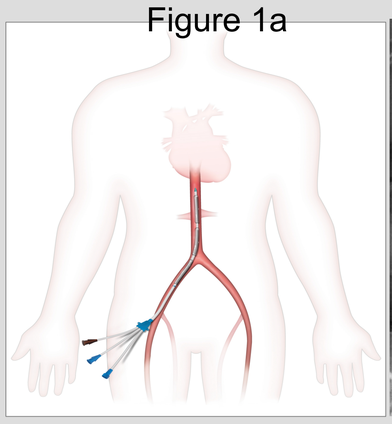
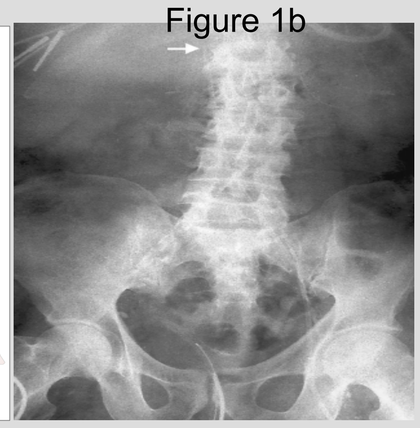


Figure 1b



## RESULTS

### Patient Characteristics

| | |
|---|---|
| Number of patients | 35 |
| Sex, M/F | 25/10 |
| Mean age, y | 65±9 |
| Hypertension | 22 |
| Diabetes | 13 |
| Atrial fibrillation | 9 |
| Mean initial GCS (range) | 9 (4 to 14) |
| CCT findings | |
| Total MCA infarction | 35 |

### Hypothermia Characteristics

The temperature course before, during and after hypothermia is illustrated in **Fig. 2.**

**Mean**

- Time between symptom onset and hypothermia induction 17.9±9 h
- Time required for cooling to 33°C 2.7±0.6 h
- Duration of hypothermia 85±10 h
- During hypothermia
  - Minimal temperature 32.1°C
  - Mean temperature 33.6°C

### Mortality and Outcome at 3 months

- 20 patients survived the hemispheric stroke (57%)
- ►Herniation caused by secondary rise in ICP during/after rewarming was the cause of death in 11 patients
- ►Survivers: Barthel index 65 (range 40 to 85)
  Rankin scale 2.9 (range 2 to 4)

### Side effects

- Arterial hypotension 70%
- Pneumonia 46%
- Bradycardia 45%
- Thrombopenia 32%
- Coagulopathy 3%
- Sepsis 6%

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**CONCLUSION** Prolonged hypothermia for the treatment of postischemic edema after hemispheric infarction is safe an feasible using the endovascular cooling approach. Substantial and sustained control of elevated ICP can be achieved in most patients. When compared to historical controls, hypothermia may reduce mortality and improve clinical outcome. A prospective, randomized trial is now on its way.