Cold Enough or Long Enough?

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Introduction

Hypothermia (Targeted Temperature Management-TTM)has been recommended for brain protection in cardiac arrest. It has been suggested to not be efficacious for traumatic brain injury. We examined the hypothesis of time versus depth of TTM. There is a single case report from 2007 that piqued our interest in this.

Methods

Patients admitted with non-penetrating head trauma, with glasgow scores of 8 or less were evaluated for entry . Exclusionary criteria included no space occupying lesion > 30cc, by CT, no operative systemic trauma,ICP< 10 at presentation, Patients all received standard resuscitation,using hypertonic saline(4-6 cc/kg), intubation,and ICP (camino)monitoring.Entry criteria was ICP >20 at four hours of resuscitation,and normal lab values.Patients were placed in TTM 32-34 Celsius for five days,using neuromuscular blockade, sedation and pain medications.Every five days rewarming was attempted,if ICP was less than 18 torr. If ICP remained less than twenty patient was rewarmed, but if ICP elevated, patient was returned to TTM for five days.This cycle was continued until ICP was controlled during rewarming, at < 18 torr.

References

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Results

Seventeen patients were treated, with a hypothermic state range of 15-35 days.Patients were evaluated by PM&R services, and cared for after transfer by their team. End point was the patient's Functional Independence measure(FIM) scores at three months. These ranged from 60 to 108,avg. 85 Mortality was 5.8 % in this small safety/efficacy series. Infections, usually pulmonary ,occured in 20% .

Conclusions

Prolonged TTM(-hypothermia) may be a useful salvage tool for refractory intracranial hypertension following trauma.This is related to the time line of the multifactorial chemical cascade in trauma.nter text here

Discussion Previous trials using hypothermia for severe TBI were inconssitent in the end point results. The National Acute Brain Injury Study:Hypothermia II concluded it was not efficacious. But the study was an acute phase study. Many researchers have noted the cascade of events in severe tBI(increased serum and urine levels of norepinephrine, epinephrine, and cortisol, increased oxygen consumption and urinary nitrogen excretion, hypozincemia, hyperzincuria, increased serum C-reactive protein and copper concentrations, and hypoalbuminemia **While the normalization of these indivdual findings varies, the general consensus is there is a three week disturbance in these processes.** Additionally, most patients with TBI have an elevated temperature,as well as excitotoxicty, neuroinflammation, apoptosis, free radical production, seizure activity, blood-brain barrier disruption, blood vessel leakage, cerebral thermopooling, **Hypothermia can inhibit or mitigate all of these mechanisms, while stimulating protective systems such as early gene activation. Hypothermia is also effective in mitigating intracranial hypertension and reducing brain edema**. The effects of hypothermia are immunosuppression,hypovolemia, insulin intolarance and altered pharmacdynamics. Careful attention to each of these can be accomplished inthe modern Neurocritical care unit. The puported effecct on cardiac dysrhythmia does not occur at moderate hypothermia. Some authorities suggest moderate hypothermia may be protective against these cardiac abnormalities