The RhinoChill™ IntraNasal Cooling System

Background Information

The RhinoChill™ IntraNasal Cooling System is a new portable and easy-to-use system for cooling the brain following cardiac arrest, stroke or traumatic brain injury. Cooling can now be initiated at the site of the event or in the ambulance, unlike conventional systems which can only be initiated once the patient has reached the hospital. It has been shown that the sooner brain temperature can be reduced following a potentially damaging event, the better it can be protected from permanent injury.

How the RhinoChill System Works

The RhinoChill IntraNasal Cooling System uses nasal catheters through which an inert, rapidly-evaporating coolant liquid is sprayed, using oxygen or air as the evaporant/carrier gas, into the nasal cavity, a large area situated directly beneath the brain that acts as a heat exchanger. Heat then dissipates through the base of the skull via conduction, and through the blood which is cooled at the skull base and then spreads via the arteries to the rest of the brain (convective hematogenous cooling).

The RhinoChill System is battery-operated and doesn't require refrigeration (the coolant bottles can be stored at room temperature). Each bottle of coolant holds enough to cool a person's brain for 30 minutes at nominal flow, and bottles can be easily exchanged to maintain the cooling process until the patient reaches the hospital.

Clinical Evidence

Clinical data has shown that the RhinoChill IntraNasal Cooling System rapidly and effectively reduces both brain and core body temperature, which leads to improved survival rates after a cardiac arrest compared with standard life support procedures when administered before the patient is fully resuscitated.

The recently-published Pre-Resuscitation Intra-Nasal Cooling Effectiveness (PRINCE) study involved 200 patients with witnessed cardiac arrest across 15 locations in Belgium, Germany, Italy, Czech Republic and Sweden, where cardiopulmonary resuscitation (CPR) had been initiated within 20 minutes of collapse. Patients were randomized to receive either the RhinoChill IntraNasal Cooling System with standard advanced cardiac life support (ACLS) care or ACLS alone until they reached the hospital, at which stage patients in both groups received therapeutic hypothermia according to hospital protocols.

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Results showed that the target tympanic temperature of 34˚C, used as an approximation of brain temperature, was reached three hours earlier in the RhinoChill™ IntraNasal Cooling System group, and the target core body temperature was reached two hours earlier. 47% of those RhinoChill System patients that were admitted to the hospital survived, compared with 31% of those receiving standard care. The survival rates in the 75% of patients who received CPR within ten minutes of collapse were 59% and 29% respectively, the difference between which was statistically significant (p=0.028).

37% of those RhinoChill System patients that were admitted to the hospital survived neurologically intact, compared with 21% of those receiving standard care. Neurologically intact survival rates in the 75% of patients who received CPR within ten minutes of collapse were 46% and 18% respectively, the difference between which was statistically significant (p=0.025).[1]

The RhinoChill IntraNasal Cooling System was first tested in the hospital setting in 84 patients that had been resuscitated following cardiac arrest. The RhinoChill System was used to initiate cooling in the emergency/critical care setting before it was practical to use standard hospital cooling methods.

The RhinoChill System was used for an average of one hour before initiating standard cooling procedures, and it effectively reduced both tympanic and core temperatures (averages of 2.4˚C and 1.6˚C respectively). There were no significant safety issues observed.[2]

A smaller US study involving fifteen patients who had experienced a stroke or traumatic brain injury were treated with the RhinoChill IntraNasal Cooling System for one hour to induce cooling while systemic cooling methods were being readied for use.

Relative cooling rates of 2.2, 1.5, and 1.1˚C/hr were measured in the tympanon, brain or core (primarily bladder), respectively. The initial average intracranial pressure was 16 mmHg and dropped an average of 5.2 mmHg, or 32.5% over the hour of RhinoChill System cooling.[3]

Availability

The RhinoChill IntraNasal Cooling System is available in select European markets starting in December 2010.

References

1. Castren M, Nordberg P, Svensson L et al. Intra-Arrest Transnasal Evaporative Cooling. A Randomized, Prehospital, Multicenter Study (PRINCE: Pre-ROSC Intra-Nasal Cooling Effectiveness). *Circulation* published online 2 Aug 2010; DOI:10.1161/CIRCULATIONAHA.109.931691

2. Busch H-J, Eichwede F, Fodisch M et al. Safety and feasibility of nasopharyngeal evaporative cooling in the emergency department setting in survivors of cardiac arrest. *Resuscitation* 2010, doi:10.1016/