心停止後早期の低体温療法は生存率を上昇させる

PRINCE：心停止後の患者に速やかに低体温療法を施行することで脳損傷を伴わない生存の確率が増大する

PRINCE: Chance of survival without brain damage greater when person in cardiac arrest is cooled quickly

心停止後、迅速に低体温療法を施行することにより脳損傷を伴わない生存の確率が改善するとのPRINCE（Pre-Resuscitation Intra-Nasal Cooling Effectiveness：蘇生前鼻腔内冷却療法の有効性）研究の結果が2009年American Heart Association学会で発表された。ヨーロッパの研究者らは、心肺蘇生（CPR）施行中に脳を冷却するRhinoChillという新たな方法を用いた。彼らは、目撃者のいる心停止成人患者200人を、標準的蘇生法群または心停止直後に低体温療法を開始する蘇生法群に無作為に割り付けた。生存して入院した患者全てがさらに標準的なクライテリアによる低体温療法を施行された。報告された患者182人（平均年齢66歳、男性71%）中、低体温療法群の46.7%が生存して退院したのに対し、標準的蘇生法群におけるその割合は31%であった。さらに、低体温療法群のうち退院時に神経学的状態が良好であったのは36.7%であり、標準的蘇生法群におけるその割合は21.4%であった。心停止後10分以内に蘇生を開始された患者137人中、低体温療法患者の59.1%が生存して退院したのに対し標準的蘇生法患者では29.4%であった。また、これらの患者のうち神経学的に問題がなかったのは低体温療法患者では45.5%であり、標準的蘇生法患者では17.6%であった（p=0.01）。

Full Text

Rapidly cooling a person in cardiac arrest may improve their chance of survival without brain damage, according to research presented at the American Heart Association's Scientific Sessions 2009.

"We now have a method that is safe and can be started within minutes of cardiac arrest to minimize damage during this very critical period," said Maaret Castren, M.D., lead author of the study and professor of emergency medicine at the Karolinska Institute in Stockholm.

For years, people hospitalized after cardiac arrest have been cooled to reduce injury to the brain and other tissues that occurs when the blood supply returns after being temporarily halted. In the PRINCE (Pre-Resuscitation Intra-Nasal Cooling Effectiveness) investigation, Castren and colleagues at 14 other centers across Europe used a new tool, RhinoChill, that cools the brain during ongoing cardiopulmonary resuscitation (CPR).

Researchers randomized 200 adults going into witnessed cardiac arrest to receive either standard resuscitation or resuscitation with cooling started as soon as possible during the arrest, with ongoing CPR. All patients who survived to hospitalization were further cooled according to standard criteria. Eighteen patients were excluded from the analysis because a 'do-not-resuscitate' order was found or there was a non-cardiac reason for their cardiac arrest.

In the 182 patients reported, 83 (average age 66 years, 71 percent male) were randomized to receive nasal cooling (although two were not cooled because of user or device problems) and 99 (average age 64.8, 78 percent male) received standard care.

RhinoChill is a non-invasive device that introduces coolant through nasal prongs. The system is battery-powered and requires no refrigeration, making it suitable for emergency medical technicians in the field to use while a person is receiving CPR.

The patients in each group were similar in their initial heart rhythms, how much time lapsed before CPR was started and whether CPR restored a pulse. The median time between arrest and the initiation of cooling was 23 minutes. On arrival at the hospital, the cooled patients' temperatures (measured at the eardrum) were significantly lower (average 34.2°C, 93.56 F) than those receiving standard care (35.5°C, 95.9 F, p = 0.0001).
In the total group:

- 46.7 percent of those cooled survived to hospital discharge, compared with 31 percent of those receiving standard care;
- 36.7 percent of those cooled were in good neurological condition on hospital discharge, compared with 21.4 percent of those receiving standard care.

In the 137 patients in whom resuscitation efforts began within 10 minutes of cardiac arrest:

- 59.1 percent of those cooled survived to hospital discharge, compared with 29.4 percent of those receiving standard care;
- 45.5 percent of those cooled were neurologically intact at hospital discharge, compared with 17.6 percent of those receiving standard care (p=0.01).
- Our results show that the earlier you can do the cooling, the better," Castren said. "When resuscitation efforts were delayed, there was no significant difference in survival."

In a time analysis, patients who received a combination of early CPR started within six minutes of collapse and cooling had the best outcomes.
Patients with ventricular fibrillation (VF) are the subgroup of cardiac arrest patients most likely to survive. In this study, of the 56 patients who had VF:

- 62.5 percent of those cooled survived to hospital discharge, compared with 47.6 percent of those who received standard care;
- 50 percent of those cooled were neurologically intact at hospital discharge, compared to 28.6 percent of those who received standard care.
- RhinoChill is easy and safe to use during a cardiac arrest outside of the hospital," said Denise Barbut, M.D., senior author of the study and president and chairman of BeneChill, Inc., maker of the device. "Although the study was not powered to look at outcomes, there seemed to be a significant benefit on survival and neurologically intact survival, specifically in those treated within 10 minutes."

Eighteen adverse reactions were reported after the treatment, including three nosebleeds and 13 nasal discolorations. Coloring spontaneously returned to normal in all patients who survived. Serious adverse events, such as seizure or repeat cardiac arrest, occurred in seven cooled patients and 14 controls.

RhinoChill has been approved for marketing in Europe and the company expects to start selling the device there in March 2010.

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