Therapeutic Hypothermia

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Hypothermia is a potentially dangerous drop in body temperature, usually caused by prolonged exposure to cold temperatures. Hypothermia for therapeutic purposes is used for its cooling effect on certain areas of the patient's body, in order to reduce the risk of ischemic tissue injury following a period of inadequate blood supply [1]. Using of this treatment reduces mortality rate from 46.51% to 25.58% [2]. Patients who have been shown to benefit from induced hypothermia include the following:

- Intubated patients with treatment initiated within 6 hours after cardiac arrest (nonperfusing ventricular tachycardia [VT] or VF)
- Patients able to maintain a systolic blood pressure >90 mm Hg, with or without pressors, after CPR
- Patients in a coma at the time of cooling

Patients for whom hypothermia may theoretically carry increased risk include those with the following conditions:

- Recent major surgery within 14 days - Possible risk for infection and bleeding
- Systemic infection/sepsis - Small increase in risk of infection
- Coma from other causes (drug intoxication, preexisting coma prior to arrest)

In addition, hypothermia is inappropriate in patients with a valid do not resuscitate order (DNR).

There are two types of the methods of producing hypothermia: invasive and noninvasive. Non-invasive methods using external sources of cooling applied on the skin cold air, ice packs, cooling beds, or as in our case a special helmet for head with Peltier elements. The use of Peltier cooling elements allow elaboration of a mobile, low size device which can be used in emergency medical services which will reduce the risk of a ischemic trauma of tissues after heart failure or blockage of arteries to embolism.

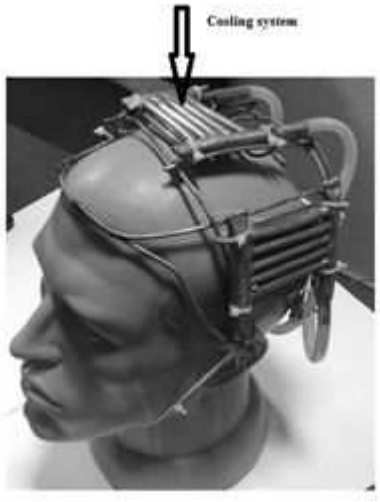

Fig. 1 The location of Peltier elements and cooling system on the human head

References:

[1] Holzer, M., “Mild hypothermia to improve the neurologic outcome after cardiac arrest.” New England J. Medicine. 346, (8) pp. 549-556, 2002.

[2] Ji-Yao Jiang, M.D., Ph.D., Ming-Kun Yu, M.D., Ph.D., and Cheng Zhu, M.D. Effect of long-term mild hypothermia therapy in patients with severe traumatic brain injury:1-year follow-up review of 87 cases October 2000.