



© Deniz Kızılaslan,
© Cem Erdoğan,
© Bahadır Çiftçi,
© Mürsel Ekinci

Detailed Therapeutic Hypothermia Protocol After Cardiac Arrest

Kardiyak Arrest Sonrası Detaylı Terapötik Hipotermi Protokolü

Received/Geliş Tarihi : 19.12.2018
Accepted/Kabul Tarihi : 25.06.2019

©Copyright 2019 by Turkish Society of Intensive Care
Turkish Journal of Intensive Care published by Galenos
Publishing House.

Keywords: Targeted temperature management, protocol, cardiac arrest

Anahtar Kelimeler: Terapötik hipotermi yönetimi, protokol, kardiyak arrest

Deniz Kızılaslan, Cem Erdoğan, Bahadır Çiftçi,
Mürsel Ekinci
Istanbul Medipol University Faculty of Medicine,
Department of Anesthesiology and Reanimation,
Istanbul, Turkey

Bahadır Çiftçi MD (✉),
Istanbul Medipol University Faculty of Medicine,
Department of Anesthesiology and Reanimation,
Istanbul, Turkey

E-mail : bciftci@medipol.edu.tr
Phone : +90 532 503 44 28
ORCID ID : orcid.org/0000-0002-3245-6614

Dear Editor,

Sudden cardiac arrest occurs in an average of 375,000 people every year in Europe (1). Cardiac arrest lasting five minutes or longer results in cerebral injury (1). In order to achieve better neurological results and improve outcomes, targeted temperature management (TTM) protocols have been developed, following clinical trials that showed good outcomes in out-of-hospital cardiac arrest (1,2). TTM protocols have been recommended in European guidelines (3).

There are three phases of brain injury in cardiac arrest: ischemic injury during arrest (irreversible damage may occur if prolonged), reperfusion injury and post reperfusion

injury. TTM targets these three phases. Hypothermia may provide neurological protection in various ways. Hypothermia decreases cerebral oxygen consumption by reducing cerebral blood flow. Decreasing cerebral metabolism protects the brain from secondary damage (2-4). Hypothermia prevents inflammation and free radical production. Hypothermia also reduces brain edema caused by a destroyed blood brain-barrier and increased vascular permeability (4).

Various protocols for TTM have been suggested and evaluated in clinical trials (1,2). The comprehensive and multidisciplinary protocol that we have established and used is one of the recommended protocols in the European Society of Intensive Care Medicine (ESICM) website's TTM library (5). Our protocol targets a temperature of 33

°C with the goal of reaching this within 4 hours. Unlike other protocols in the ESICM TTM library, in our protocol NaCl solution of +4 °C that is used for hypothermia is given according to the patient's weight. Central venous pressure (CVP) measurement is performed every 6 hours. The target CVP value is 8-12 mmHg and fluid resuscitation is performed below this value. Propofol and remifentanyl infusion is administered for sedation, which allows early neurological evaluation. If shivering develops, 20 mg IV pethidine is administered. If shivering persists, MgSO₄ infusion prepared according to the protocol is performed. MgSO₄ infusion is another important element that separates our protocol from the others in the ESICM TTM library. However, MgSO₄ infusion is not performed if the patient is anuric. There is no neuromuscular blocker in the protocol to prevent chronic illness myopathy. The body temperature is increased by 0.5 °C if severe bradycardia (HR <45/min) occurs after reaching the target temperature. The patient is kept at the target body temperature for 24 hours.

Neurological evaluation has an important role in our protocol and detailed neurological analysis is performed. Electroencephalogram monitoring and brain stem reflex monitoring with the coma recovery scale are performed on the first and third days. A detailed neurology consultation is carried out with the results of these tests. Our protocol

is multidisciplinary: cardiology evaluation is performed in addition to neurology consultation.

The normothermia target is 36.5 °C and slow heating (0.25 °C/hour) is performed to prevent postreperfusion injury (4). If the patient is still unconscious, they are kept at the target temperature for 72 hours. If the patient has a body temperature of >37 °C 1 g paracetamol IV is administered every 4 hours, if liver function tests are normal.

In conclusion, we have used our TTM protocol following cardiac arrest for five years, it is suggested as a reference protocol in ESICM TTM library.

Ethics

Informed Consent: Consent form was filled out by all participants.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: D.K., C.E., Design: D.K., C.E., Data Collection or Processing: D.K., C.E., Analysis or Interpretation: D.K., C.E., Literature Search: B.Ç., M.E., Writing: B.Ç., M.E.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Hypothermia after Cardiac Arrest Study Group. Mild therapeutic hypothermia to improve the neurologic outcome after cardiac arrest. *N Engl J Med* 2002;346:549-56.
2. Bernard SA, Gray TW, Buist MD, Jones BM, Silvester W, Gutteridge G, et al. Treatment of comatose survivors of out-of-hospital cardiac arrest with induced hypothermia. *N Engl J Med* 2002;346:557-63.
3. Morrison LJ, Deakin CD, Morley PT, Callaway CW, Kerber RE, Kronick SL, et al. Part 8: Advanced life support: 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Circulation* 2010;122(16 Suppl 2):S345-421.
4. Fukuda T. Targeted temperature management for adult out-of-hospital cardiac arrest: current concepts and clinical applications. *J Intensive Care* 2016;4:30.
5. Medipol Mega Hospitals Complex General Intensive Care Unit Therapeutic Hypothermia Protocol. ESICM TTM Library Web. Last accessed date: May, 2018. Available from: <https://www.esicm-old.org/ttm/public/uploads/documents/11/11-Turkey-Medipol.pdf>