



ORIGINAL ARTICLE

Predictors of death among cardiac arrest patients after therapeutic hypothermia: A non-tertiary care center's initial experience



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KEYWORDS

Therapeutic hypothermia;
Cardiac arrest;
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Abstract

Introduction and Objectives: Therapeutic hypothermia (TH) is recommended for patients with return of spontaneous circulation (ROSC) after cardiac arrest (CA). There is still uncertainty about management, target temperature and duration of TH. In the present study we aim to describe the initial experience of a non-tertiary care center with TH after CA and to determine predictors of mortality.

Methods: During the period 2011-2014, out of 2279 patients hospitalized in the intensive care unit, 82 had a diagnosis of CA with ROSC. We determined predictors of mortality and neurological outcome in comatose patients with ROSC after CA treated by TH.

Results: A total of 15 patients were included, mean age 47.3 ± 14 years, 10 (67.0%) male. CA occurred out-of-hospital ($n=11$; 73.3%) or in-hospital ($n=4$; 26.7%), in initial shockable ($n=10$; 66.7%) or non-shockable ($n=5$, 33.3%) rhythm. The mean time from CA to ROSC (CA-ROSC) was 44.7 ± 36.5 min. All patients met the 24-hour TH target temperature of 33°C . The mean neuron-specific enolase (NSE) level was 93.7 ± 109.0 $\mu\text{g/l}$. Seven patients (46.7%) were discharged with good cerebral performance and eight (53.3%) died. Patients who survived had lower median age ($p=0.032$), shorter CA-ROSC ($p=0.048$), lower NSE levels ($p=0.020$) and initial ventricular fibrillation rhythm ($p=NS$).

Conclusions: The effectiveness of TH appears to be related to younger age, shockable initial rhythm and shorter CA-ROSC time. This results indicates some lines of inquiry that should be developed in appropriate prospective studies. The role of biomarkers as predictors of prognosis is an open question, with NSE potentially playing an important role.

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PALAVRAS-CHAVE

Hipotermia
terapêutica;
Paragem cardíaca;
Enolase específica
dos neurónios

Preditores de morte em doentes pós-paragem cardíaca submetidos a hipotermia terapêutica: experiência inicial de um centro não-terciário

Resumo

Introdução e objetivos: A Hipotermia Terapêutica (HT) é recomendada em doentes com recuperação da circulação espontânea (ROSC) após paragem cardíaca (PC). Dúvidas persistem sobre a melhor abordagem, a temperatura alvo e a duração da técnica. Neste estudo descrevemos a experiência inicial de um centro não-terciário com HT após PC e procuramos preditores de mortalidade.

Métodos: Durante os anos de 2011-2014, dos 2279 doentes hospitalizados na unidade de cuidados intensivos, 68 tinham diagnóstico de PC com ROSC. Determinámos preditores de mortalidade e prognóstico neurológico nos doentes comatosos com ROSC após PC, submetidos a HT.

Resultados: Quinze doentes, $47,3 \pm 14$ anos, dez (67,0%) do sexo masculino. A PC ocorreu extra (n=11; 73,3%) ou intra-hospitalar (n=4; 26,7%), em ritmo cardíaco inicial desfibrilhável (n=10; 66,7%) ou não-desfibrilhável (n=5, 33,3%). O tempo médio decorrido desde a PC até à ROSC (PC-ROSC) foi de $44,7 \pm 36,5$ min. O valor médio da enolase específica dos neurónios (NSE) foi de $93,7 \pm 109,0$ $\mu\text{g/L}$. Sete doentes (46,7%) tiveram alta hospitalar com bom desempenho cerebral e oito doentes (53,3%) faleceram. Os doentes que sobreviveram apresentavam idade média inferior ($p=0,032$), menor tempo PC-ROSC ($p=0,048$), doseamentos mais baixos de NSE ($p=0,020$) e ritmo inicial predominante de fibrilhação ventricular ($p=NS$).

Conclusões: A eficácia da HT parece relacionada com idades mais jovens, ritmo inicial desfibrilhável e tempo PC-ROSC reduzido. Estes resultados apontam algumas linhas de investigação que estudos prospetivos adequados deverão desenvolver. O papel de biomarcadores preditores de prognóstico é um tema em aberto, devendo a NSE ocupar um lugar particular neste domínio. © 2016 Sociedade Portuguesa de Cardiologia. Publicado por Elsevier España, S.L.U. Todos os direitos reservados.

List of abbreviations

ALS	advanced life support
BNP	B-type natriuretic peptide
CA	cardiac arrest
CPC	Cerebral Performance Category
CPR	cardiopulmonary resuscitation
CT	computed tomography
CV	cardiovascular
EEG	electroencephalography
GCS	Glasgow Coma Scale
ICU	intensive care unit
ILCOR	International Liaison Committee on Resuscitation
NSE	neuron-specific enolase
NT-proBNP	N-terminal pro-B-type natriuretic peptide
PCI	percutaneous coronary intervention
ROSC	return of spontaneous circulation
STEMI	ST-segment elevation myocardial infarction
TH	therapeutic hypothermia
CA-CPR	time from collapse to cardiopulmonary resuscitation
CA-ROSC	time from collapse to return of spontaneous circulation
CA-TH	time from collapse to beginning of therapeutic hypothermia
TTE	transthoracic echocardiography
VF	ventricular fibrillation

Introduction

Cardiac arrest (CA) with cerebral ischemia can lead to severe neurological damage and death. The survival rate of out-of-hospital CA is reported to be 2-11%, rising to 20-40% in witnessed ventricular fibrillation (VF) cases.¹⁻³

Induced hypothermia has been employed as a therapeutic approach for CA survivors and other critically ill patients for decades.⁴ Two randomized controlled trials published in 2002 reported a dramatic improvement in survival and neurological outcome for comatose survivors of out-of-hospital VF CA with therapeutic hypothermia (TH).^{5,6}

TH (32 °C-34 °C for 12-24 hours) has been the standard of care for patients remaining comatose after resuscitation.^{7,8} A recent randomized trial found a similar outcome in patients treated with targeted temperature management at either 33 °C or 36 °C,⁹ prompting the International Liaison Committee on Resuscitation (ILCOR) Advanced Life Support (ALS) Task Force to perform a systematic review.¹⁰ Currently, a constant temperature between 32 °C and 36 °C for at least 24 hours is the recommended targeted temperature management for adults following out-of-hospital CA with an initial shockable rhythm and, with a lower level of evidence, for out-of-hospital CA with a non-shockable rhythm and in-hospital CA.¹¹

The aim of this retrospective analysis was to describe the initial experience of a non-tertiary care center and to determine predictors of mortality and neurological outcome at discharge for CA patients treated with TH, focusing on a combination of initial rhythm, time to return of spontaneous circulation (ROSC) and laboratory biomarkers.

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