Safety of Therapeutic Hypothermia in Post VF/VT Cardiac Arrest Patients

Abstract:
A Riaz, H Heib, B Foley, N Mulvihil, P Crean, RT Murphy, C Daly, N Boyle
Cardiology Department, St James Hospital, James St, Dublin 8

Therapeutic hypothermia (TH) is a process of cooling a patient post ventricular arrhythmia (VF/VT) or cardiac arrest to 32-34°C for 24 hours. This improves neurologic outcome and is part of current guidelines. Hypothermia prolongs QT interval, which can precipitate torsades de pointes (TdP). We performed a retrospective review of all patients who received TH in our hospital over a period of 2 years to assess the effect of TH on the corrected QT interval (QTc) and any possible pro-aryrhythmia. A total of 13 patients received TH. QTc prolonged in all patients with an average of 60.3±57.2 ms, and up to 109.6±80.4 ms in patients who received Amiodarone concurrently. No TdP was seen in any patient. We conclude that TH is safe, though careful monitoring of the QTc interval is advisable especially with concurrent use of QT prolonging drugs.

Introduction
Studies have shown that post cardiac arrest due to ventricular fibrillation, systemic cooling to a bladder temperature between 32°C and 34°C for 24 hours improves outcomes. On the basis of this evidence Therapeutic Hypothermia (TH) was introduced in the 2002 International Liaison Committee on Resuscitation (ILCOR) guidelines and recommended in European Resuscitation Council (ERC) 2005 guidelines. The QT interval is the time interval on the electrocardiogram (ECG) between the beginning of the QRS complex to the end of T wave. Its prolongation can lead to polymorphic VT (torsades de pointes). Acquired QT prolongation can be due to a variety of different causes including hypothermia. The subject of this study. In this study we performed a retrospective review of all patients who received TH in our hospital over a period of 2 years to assess the effect of TH on QTc and any possible arrhythmogenesis.

Methods
This is a retrospective case review study. Case records were reviewed to collect data on all patients who received therapeutic hypothermia for VF/VT cardiac arrest in our hospital between Jan 2009 and May 2011. Patients with paced rhythm were excluded. Baseline case characteristics were noted. All ECGs and QTc intervals were assessed in relation to the beginning and after TH. Other factors influencing QT interval were also assessed. Cooling was performed in all patients by the Blanketrol III system (Cincinnati Sub-Zero, Cincinnati, OH, USA). Core body temperature was monitored by urinary bladder probes. Continuous telemetry rhythm monitoring was performed on all patients. All ECGs were performed on a Philips Pagewriter, XLi machine and the QTc measurement as calculated by the programmed machine algorithm was accepted. In the presence of a bundle branch block, Bazett's formula was used on manual measurement of QT interval in which QRS duration was assumed at 120ms. Microsoft Excel 2004 Mac edition software was used to analyze the data.

Results
A total of 13 patients received TH for VF/VT cardiac arrest during the 2.5 years between Jan 2009 and July 2011. One patient with a paced rhythm was excluded, and the remaining 12 patients were included in the study (n=12). Eight patients were male and four were female. The average age was 63 years. The substrate for cardiac arrest was ischemic in 7 patients (58 %) and non-ischemic in 5 patients (42 %). Echocardiography showed left ventricular (LV) function was normal in 4 patients and impaired in remaining 8 patients. The average duration of cardiopulmonary resuscitation (CPR) before return of spontaneous circulation was 8 minutes. Four patients died and eight patients had a complete recovery; of these patients, four received an implantable cardiac defibrillator (ICD). The average duration of TH was 27.25 hours. QTc prolongation was observed in all patients, and was more pronounced in patients who received Amiodarone concurrently. At the end of TH the QTc interval returned to baseline in all patients. The average prolongation of QTc was 80.3±57.2 ms, and continuous rhythm monitoring of all these patients did not record any episodes of torsades de pointes in spite of QTc prolongation.

QTC prolonged into the abnormal range in all but 1 patient; the average QTc at lowest body temperature was 533±64.5 ms. Four patients received Amiodarone before or during the process of hypothermia either as a single bolus or intravenous infusion. These patients demonstrated a greater degree of QTc prolongation (cases 2, 7, 8 and 11) with an average increase of 109.7±80.4 ms. This compared to average increase of 65.6±40.4 ms. in patients who did not receive Amiodarone concurrently. At the end of TH the QTc interval returned to baseline in all patients. The average prolongation of QTc was 80.3±57.2 ms, and continuous rhythm monitoring of all these patients did not record any episodes of torsades de pointes in spite of QTc prolongation.

Discussion
Our study adds to the existing evidence illustrating QTc prolongation in patients undergoing TH following cardiac arrest due to VT or VF. In spite of significant prolongation of QTc no arrhythmia such as torsades de pointes was seen. TH appears a safe procedure but careful monitoring of QTc is advisable particularly in those patients receiving Amiodarone.

Correspondence: A Riaz
Cardiology Department, St Vincent's University Hospital, Elm Park, Dublin 4
Email: asimria111@hotmail.com

References