# QTc prolongation during therapeutic hypothermia: are we giving it the attention it deserves?

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## Introduction

- Therapeutic hypothermia is used in neuroprotection following cardiac arrest due to VT and VF.
- Hypothermia is known to cause potentially arrhythmogenic effects.
  - Hypothermia → QTc prolongation → induce polymorphic VT and VF → refibrillation?
- Aims: To investigate the effect of therapeutic hypothermia on the QTc interval.

## Methods

- ROSC → TH at 32 ~ 34 ºC for 24hrs
- 設備：Laerdal Medicool kit
- Check K and Ca level
  - during hypothermia and within 24hrs before and after hypothermia
- ECG: pre-TH, during TH, post-TH
- Statistical analysis: Pearson's correlation coefficient
  - PPC value: -1 ~ 1

## Case Reports

| | OHCA的原因 | ROSC後的ECG | Management |
|---|---|---|---|
| 49M | VT | Sinus rhythm with T inversion in lateral leads | ICD |
| 51M | STEMI→VF | New LBBB | ICD |
| 65M angina | Non-STEMI → VF | Anterior wall Q-waves | Amiodarone for 24hrs, cardiogenic shock → death |
| 59F | Chest pain →VF | New LBBB | Thrombolysis for STEMI, TH, inotropic support; intractable VF → death |

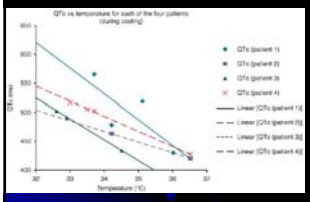
## Results - I

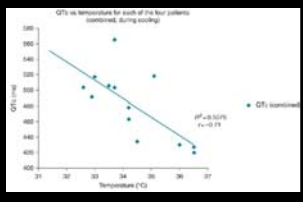
- Relationship between temperature and QTc
  - A significant increase in the QTc was seen in each of these 10 ECGs.
  - All four patients had normal QTc values prior to hypothermia and the QTc returned back into the normal range

| Patient | Pre-TH QTc 1 | QTc 1 during TH | QTc 2 during TH | QTc 3 during TH | Post-TH QTc 1 |
|---|---|---|---|---|---|
| 1 | 430 ms | 518 ms (+24.5%) | 565 ms (+35.8%) | 478 ms (+14.9%) | 430 ms (20 h) |
| 2 | 438 ms | 442 ms (+3.1%) | 463 ms (+5.7%) | | 410 ms (28 h) |
| 3 | 434 ms | 503 ms (+15.9%) | 491 ms (+13.1%) | | 387 ms (69 h) |
| 4 | 427 ms | 503 ms (+17.8%) | 517 ms (+21.1%) | 505 ms (+18.2%) | N/A |

## Results - II

- Temperature ↓ → QTc prolongation ↑
  - Clear negative correlation: PCC value - 0.71
- Patient 1: K 3.3 mmol/L prior to cooling





## Discussion - I

- Hypothermia is known to cause numerous potentially arrhythmogenic cardiovascular and electrophysiological effects
  - Atrial fibrillation with slow ventricular rate.
  - The Presence of J-waves (Osborn waves).
  - Bradycardias, including junctional and even asystole.
  - Prolongation of PR, QRS, and QTc intervals
  - Premature ventricular beats, VT, and VF.
  - The effect of hypothermia on success of defibrillation is less clear.
  - Electrophysiological changes in hypothermia are similar to those is ischaemia.
  - Reduced efficacy of inotropic drugs and antiarrythmics
  - Serum hypokalemia and hypomagnesemia.

## Discussion - II

- 6 ECG in our series showed QTc >500 ms
  - QTc prolongation is itself a cause of polymorphic VT and VF
- Amiodarone is the most used antiarrythmic drug in VT and VF.
  - amiodarone has been shown to cause torsades de point due to QTc prolongation

## Discussion - III

- There are no guidelines on ECG monitoring during TH.
  - Guidelines on ECG monitoring during TH are required.
- Temporary pacing can be performed in the treatment of resistant VT.