

## JOURNAL READING

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2014/01/13

### Case Report

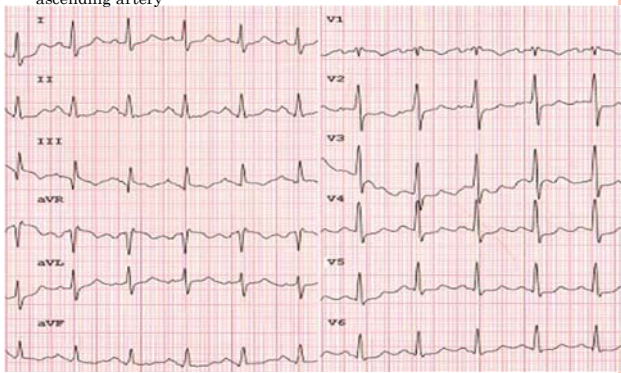
Long QT interval in a patient after out-of-hospital cardiac arrest with hypocalcaemia, undergoing therapeutic hypothermia<sup>☆</sup>

F.M. Szymanski et al. / American Journal of Emergency Medicine 31 (2013) 1722.e1–1722.e3

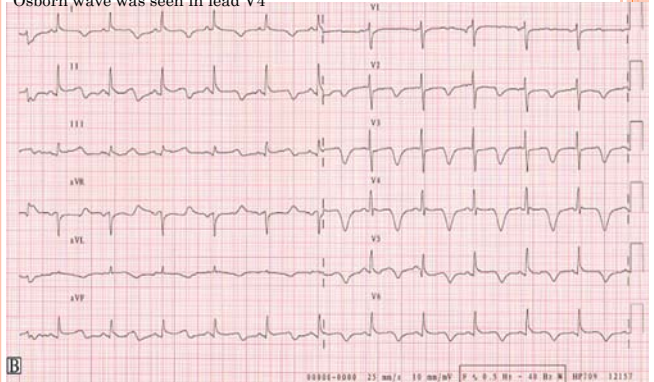
- Patient data: 53y/o, female, OHCA, VT s/p defibrillation
- On admission: GCS:4, T:36.2C, HR:130; BP:180/100mmHg
  - ABG:
  - Troponin I:1.55→12.5 → 8.22 ng/mL,
  - CK-MB:32.2→166→140 ng/mL
  - Ca:1.81 mmol/L [norm 2.15-2.60]
  - Brain CT: no specific finding
  - EKG

pH	7.26	7.25~7.45
pCO <sub>2</sub>	36.5	35~45
pO <sub>2</sub>	104	83~108
K	3.6	3.6~5.0
lactate	3.7	0.5~1.6

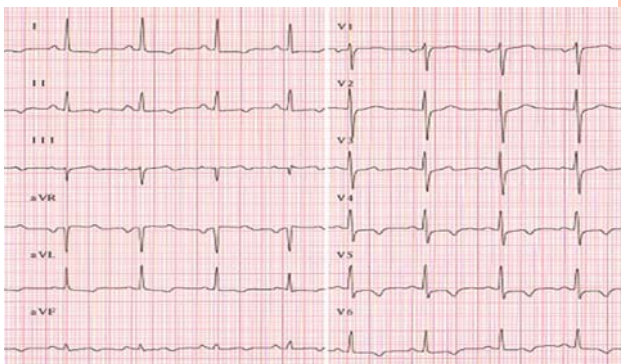
Sinus rhythm of 117 bpm, RBBB, and left atrium abnormalities.  
ST depression up to 1mm : V2-V6, with ST elevation in aVR.  
QTc interval: 452 ms  
Angiography: critical occlusion of proximal part of left anterior ascending artery



HT therapy BT:33.0°C ; Sinus rhythm 69 bpm, QTc interval of 616ms, depression of ST interval.  
Elevation of ST-segment up to 1mm: lead I, II, III, aVF, V5, V6.  
Negative T waves: I, II, aVL, aVF, and V2-V6 leads.  
Osborn wave was seen in lead V4



After HT therapy: 36.0°C, Sinus rhythm of 87 bpm, QTc interval of 397 ms,  
Negative T waves in I, II, aVL, aVF, and V4-V6 leads.  
Osborn wave resolved along with shortening the QTc interval



- Day 3 of hospitalization , extubation, GCS score 15, BP:120/70 mmHg, HR: 86 bpm, BT: 37.1°C,
- Ca: 2.31 mmol/L.
- discharged status: CPC 1, without any complications.

- Common ECG finding in HT:

- Osborn waves,
- prolongation of PR, QRS or QT intervals,
- varied T-waves abnormalities,
- atrial or ventricular arrhythmias

- HT would let us miss acute coronary syndrome or pericarditis

- Osborn wave

- a late delta wave at the end of the QRS complex, or as a small secondary R wave (R').
- occur in **hypothermia, hypercalcaemia**.
- the height usually reflects degree of the hypothermia.
- can be mimicked by AV block,
- have low voltage and be limited to few leads

#### 常見QT延長(QT prolongation)的原因

藥物	1.Type IA抗心律不整藥物(quinidine, procainamide) 2.Type III抗心律不整藥物(amiodarone,sotalol) 3.TCA 4.Phenothiazines抗精神分裂藥物
電解質	1.低血鉀 2.低血鎂 3.低血鈣
中樞神經問題	1.中風(stroke) 2.ICH或brainstem bleeding 3.Coma 4.Seizure
其他	1.RBBB,LBBB或IVCD 2.心肌缺血或梗塞 3. <b>Hypothermia</b>

#### HYPOCALCEMIA

- Hypoalbuminemia
- Hypomagnesemia
- Hyperphosphatemia
- Primary aldosteronism
- Hyperparathyroidism(PTH deficiency or resistance)
- Congestive heart failure,
- Acute and chronic hyperadrenergic stressor states,
- High dietary sodium,
- Low dietary calcium intake with hypovitaminosis D

#### Clinical paper

#### Time to awakening and neurologic outcome in therapeutic hypothermia-treated cardiac arrest patients<sup>☆,☆☆</sup>

Anne V. Grossestreuer<sup>3</sup>, Benjamin S. Abella<sup>3</sup>, Marion Leary<sup>3</sup>, Sarah M. Perman<sup>3</sup>, Barry D. Fuchs<sup>3</sup>, Daniel M. Kolansky<sup>5</sup>, Marie E. Beylin<sup>3</sup>, David F. Gaieski<sup>3,4,5</sup>

A.V. Grossestreuer et al. / Resuscitation 84 (2013) 1741–1746

- Purpose: to determine the duration to post-arrest awakening and factors associated with times to such responsiveness.
- Retrospective chart review
- Three hospitals participating in a US cardiac arrest registry from 2005 to 2011. **194 pt**
- Inclusion criteria:
  - resuscitation from SCA
  - with post-arrest neurologic injury (GCS Motor Score <6)
  - with no primary neurologic cause of arrest.
  - Consecutive TH-treated patients
- Awakening: time from arrest until **first GCS M6**

**Table 1**  
Demographics.

	N (%)
Male	114/194 (59)
Race	
Black	89/194 (46)
White	85/194 (44)
Other	20/194 (10)
VF/VT <sup>a</sup>	76/190 (40)
Out-of-hospital/ED arrest	148/194 (76)
Out-of-hospital VF/VT <sup>b</sup>	66/191 (35)
Survived to discharge	85/194 (44)
Discharged neurologically intact	66/194 (34)
Care withdrawn before hospital discharge <sup>c</sup>	81/190 (43)
Median [IQR]	
Age (years)	59 [48,68]
Duration of TH (h)	24 [21,26]
Duration of rewarming (h)	11 [7,16]
Time from arrest to withdrawal of care (days)	3.8 [2.2, 7.6]

<sup>a</sup> 4 patients lack documented initial rhythm.

<sup>b</sup> 3 patients missing information.

<sup>c</sup> 4 patients had care withdrawn according to brain death protocol.

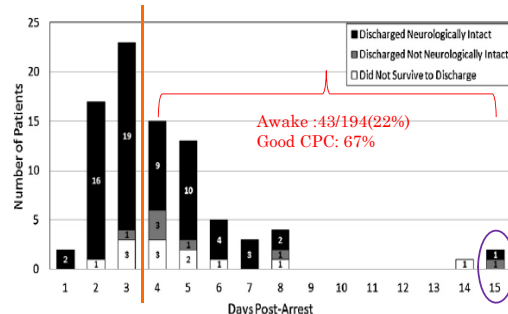


Fig. 1. Time to awakening by day post-arrest.

- Total awake: (44%)85/194; the median time to awakening: 3.2 days
- first 24 h: 2%, 24~48 h: 20%, 48~72h: 28%, >72 h : 49%
- 12/85 died, 10/12 withdraw care; 12pt alive but not awake

**Table 2**  
Time to awakening post-arrest.

	Median [IQR] (days)	p-value
Time to awakening (n=85)	3.2 [2.2, 4.5]	
Discharged neurologically intact (n=66)	2.8 [2.0, 4.5]	0.035
Not discharged neurologically intact (n=19)	4.0 [3.5, 7.6]	
Survived to discharge (n=73)	3.0 [2.1, 4.5]	0.505
Did not survive to discharge (n=12)	3.5 [2.4, 4.7]	
ESRD (n=15)	3.6 [2.4, 6.8]	0.366
No ESRD (n=70)	3.0 [2.1, 4.4]	
VF/VT (n=43)	2.8 [2.0, 4.4]	0.269
Asystole/PEA (n=39)	3.5 [2.4, 5.1]	
ED/out-of-hospital (n=60)	3.0 [2.2, 4.6]	0.758
In-hospital (n=25)	3.3 [2.1, 4.2]	
Out-of-hospital VT/VF (n=37)	2.8 [2.0, 4.4]	0.573
Not out-of-hospital VT/VF (n=46)	3.4 [2.3, 5.0]	
Paralytic used (n=78)	3.4 [2.2, 4.5]	0.250
No paralytic used (n=7)	2.5 [1.2, 13.7]	
Seizure (n=6)	3.8 [3.2, 6.2]	0.090
No seizure (n=78)	2.9 [2.1, 4.5]	

<sup>a</sup> Values in bold font are statistically significant.

**Table 3**  
Out-of-hospital VF/VT arrests.

	N (%)
Total out-of-hospital VF/VT arrests	66/191 (35)
Regained awakening	37/66 (56)
Survived to discharge	35/37 (95)
Discharged neurologically intact	35/35 (100)
Median [IQR]	
Time to awakening (days)	2.8 [2.0, 4.4]

**Table 4**  
Effects of sedative use on time to awakening.

	All patients	Patients who did not regain awakening	Patients who regained awakening	Patients who regained awakening ≤72 h post-arrest	Patients who regained awakening >72 h post-arrest
<b>Fentanyl</b>					
n	165	85	78	39	39
Days	3.1 ± 1.4	2.8 ± 1.3	3.6 ± 1.3	3.3 ± 1.4	3.9 ± 1.1
p-value			0.000		0.033
<b>Lorazepam</b>					
n	140	67	72	34	38
Days	2.5 ± 1.3	2.1 ± 1.1	2.8 ± 1.4	2.6 ± 1.4	3.0 ± 1.5
p-value			0.007		0.249
<b>Propofol</b>					
n	59	23	35	21	14
Days	2.2 ± 0.9	2.3 ± 1.4	2.0 ± 0.7	2.4 ± 1.0	2.1 ± 1.1
p-value			0.324		0.316
<b>Midazolam</b>					
n	62	35	27	12	15
Days	1.7 ± 1.1	1.7 ± 1.2	1.7 ± 1.1	1.3 ± 0.7	2.1 ± 1.3
p-value			0.994		0.084

- 若醒來當天有給paralytic, 18/19 (95%)→good CPC; 若醒來當天未給paralytic 48/66 (73%)→good CPC (p = 0.042).
- 停止paralytics才醒, 3.4 ± 2.9 days.
  - Good CPC: 2.1 ± 2.4 days;
  - Poor CPC: 4.1 ± 4.0 days ion (p = 0.009).
- Survived to discharge:有seizure:11/35 (31%) versus 無seizure: 73/156 (47%) (p = 0.098).
- Good CPC:有seizure:3/35 (9%) versus 無seizure: 62/156 (40%) (p < 0.001).

- 10 patients took >6 days to awaken (median: 7.5 days; range: 6.2–14.5 days).
  - anti-epileptic medications for prior seizure history (n = 2),
  - severe sepsis (n = 2),
  - recurrent cardiac arrest (n = 1),
  - stroke as the initial admission complaint (n = 1),
  - Prolonged sedative medications for agitation/post-operative pain (n = 3),
  - ESRD with prolonged sedation via continuous benzodiazepine infusion (n = 1).

## DISCUSSION

- Shorter time to awakening was significantly associated with better neurologic outcome.
- Time to awakening was not associated with age, sex, race, initial rhythm, ESRD, paralytic use, seizure, or location of arrest.
- Different defined of “awakening”
- Limitations:
  - Retrospective study
  - Different sedative and paralytic use in post-arrest patients and their impact on time to awakening
  - Small population
  - Withdraw care

