Sports Cardiology Case Presentation

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Disclosures: None
52 year old Caucasian male

- Recreational runner
- Runs 1-2h per week, completed several 5K, 10K runs prior
- No cardiac symptoms
- No medical history, no medications
- Never smoker

- Silverstone Half Marathon
Silverstone – The race
Witness report

• No signs of difficulty prior to collapse.
• Fell forward without clear mechanical cause with fascial injury.
• First responders.
• No convincing pulse and CPR commenced/tolerated.
• By the time defibrillator arrived and applied there was rhythm.
Post “ictal”/event period

• Immediate GCS 3/15
  • within 3 mins GCS 7/15 (E2,V1,M4) with head turning to the left, jaw clenching and eye deviation to the left, tonic posture, remained unresponsive
  • Airway patent
  • Pupils equal and reactive to light
• Within 10mins GCS 14/15
  • Disorientation in time
  • Repeated questioning “did i finish?” “Where is my family”
• Blood glucose normal
• Normal intial observations
• No focal motor or sensory deficit
Initial tests?

- A) Temperature, Sodium, Glucose
- B) ECG & Cardiac monitoring
- C) None of the above, CT head
- D) All of the above
Initial tests?

- Temperature
- Sodium
- Glucose
- ECG
- Cardiac monitoring
- CT head
Admitted under cardiology

- ECGs and 24h rhythm monitoring: No dynamic changes, single episode NSVT, 7 beats

- Cardiac troponins – 338ng/L (initial), 334 ng/L (12h) [normal <100ng/L]

- Echocardiogram unremarkable
- CT Head: right maxillary fracture, soft tissue injury

- ...What next?
What next?

• A) Discharge, do nothing?
• B) ICD?
• C) Home with Life vest?
• D) Anything else?
Diagnosis

• Head injury with concussion, secondary brady-asystole and spontaneous recovery

• Profound vasovagal syncope with prolonged cerebral hypoperfusion in context of acidosis/dehydration

• Cardiac rhythm disturbance, secondary to...
Cerebral Hypoperfusion

Volume depletion

Vasodilation

Heat

ADP Acidosis

Empty LV

Increased Mechano-receptor activity

Reduced Activity from Muscle Pump

Altered Neuro-cardiogenic reflexes

? Potentiated by sudden withdrawal of sympathetic tone
Referred to London Sports Cardiology Centre

- ECG
- Echo
- 24h tape
- ETT (supervised)

- Bloods: Total cholesterol 4.0, TG 0.59, HDL 1.8, LDL 1.9
Results

• 24h tape:
  – 8x VEs – variable morphologies, occasional AEs, short episodes atrial bigeminy

• ETT:
  – 15min34 Bruce protocol on treadmill, achieved 98% max HR at a workload of 18 METS. Test terminated due to fatigue and lightheadedness. Isolated PVCs with one couplet. No significant ST changes. Marked drop in BP in initial recovery.
ETT

Patient ID: 2655864
20.04.2016
14:06:18

141 bpm
RECOVERY
1:00
BRUCE
0.0 mph
0.0 %
<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Max. ST Exercise</th>
<th>Peak Exercise</th>
<th>Test End Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>0:01</td>
<td>15:30</td>
<td>7:00</td>
<td>0:04</td>
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<tr>
<td></td>
<td>64 bpm</td>
<td>166 bpm</td>
<td>99 bpm</td>
<td>124/80 mmHg</td>
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</table>

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<td>7:00</td>
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<td></td>
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### Electrocardiogram Analysis

<table>
<thead>
<tr>
<th>Channel</th>
<th>Baseline</th>
<th>Exercise</th>
<th>Peak</th>
<th>Recovery</th>
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<tbody>
<tr>
<td>I</td>
<td>0.25 mm</td>
<td>-0.15</td>
<td>-0.15</td>
<td>0.15</td>
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<tr>
<td></td>
<td>0.06 mV/s</td>
<td>-0.10</td>
<td>0.95</td>
<td>-0.05</td>
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<tr>
<td></td>
<td></td>
<td>-0.35</td>
<td>-0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>II</td>
<td>0.45</td>
<td>1.30</td>
<td>0.78</td>
<td>0.72</td>
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<td></td>
<td>0.14</td>
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<td></td>
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<tr>
<td>III</td>
<td>-0.23</td>
<td>1.14</td>
<td>-0.28</td>
<td>0.67</td>
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<tr>
<td></td>
<td>-0.23</td>
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<td></td>
<td></td>
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<tr>
<td>aVR</td>
<td>0.35</td>
<td>0.52</td>
<td>-0.65</td>
<td>-0.67</td>
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<tr>
<td></td>
<td>0.52</td>
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<tr>
<td>aVL</td>
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<td>0.30</td>
<td>-0.40</td>
<td>-0.20</td>
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<tr>
<td>aVF</td>
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<td>0.90</td>
<td>0.05</td>
<td>0.20</td>
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<tr>
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<tr>
<td>aVR</td>
<td>0.50</td>
<td>0.90</td>
<td>0.05</td>
<td>0.20</td>
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<tr>
<td></td>
<td>0.63</td>
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<tr>
<td>V1</td>
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<tr>
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<td>0.32</td>
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<td>V2</td>
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<td>0.35</td>
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<tr>
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<td>0.35</td>
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<td>V4</td>
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<tr>
<td>V6</td>
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<tr>
<td></td>
<td>0.35</td>
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</table>
What next?....

• A) Do nothing, discharge
• B) CT coronary angiogram
• C) Coronary angiogram
• D) Cardiac MRI
• E) B±C & D
Diagnosis

- Primary myocardial pathology resulting in compromising ventricular arrhythmia (e.g. cardiac sacoidosis) and IHD incidental

- Ischaemia-perfusion demand mismatch driving compromising ventricular arrhythmia and resultant hypoperfusion myocardial infarction
Findings
Learning points

• 1
• 2
• 3
1. Red Flags in Athletes with Syncope

- Age > 45 years old
- Syncope whilst lying supine or syncope without warning
- Chest pain, palpitation, headache, transient seizure like activity.
- New or unexplained breathlessness
- Known history of cardiovascular disease
- Family history of premature SCD
- Cardiac murmur/ focal neurology
- Abnormal ECG
2. SCD/SCA and endurance running

Race Distance at the time of Sudden Cardiac Arrest

Webner D MSSE 2012

Kim NEJM 2012
2. SCD/SCA and endurance running

Risk in Relation to Running Times

- **COSTUMES**
  - 5 hours plus
  - LOW RISK

- **MIDDLE AGED RUNNER**
  - 3-4 hours
  - HIGH RISK GROUP

- **ELITE/CLUB**
  - < 3 hours
  - LOW RISK

Cardiac Risk in the Young Centre for Sports Cardiology
### 3. Pitfalls of the ETT

#### Table 3. Diagnostic accuracy of noninvasive modalities for detection of CAD

<table>
<thead>
<tr>
<th>Imaging modality</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT angiography</td>
<td>91</td>
<td>93</td>
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<tr>
<td>Stress echocardiography</td>
<td>79</td>
<td>87</td>
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<tr>
<td>MPI-SPECT</td>
<td>86</td>
<td>74</td>
</tr>
<tr>
<td>MPI-PET</td>
<td>89</td>
<td>90</td>
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<tr>
<td>Stress MR perfusion</td>
<td>91</td>
<td>81</td>
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<tr>
<td>Stress MR wall motion</td>
<td>83</td>
<td>86</td>
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<tr>
<td>MR coronary angiography</td>
<td>73</td>
<td>86</td>
</tr>
<tr>
<td>Exercise electrocardiogram</td>
<td>68</td>
<td>77</td>
</tr>
</tbody>
</table>
3. Pitfalls of the ETT - Ischaemia Cascade

Exercise load

- Ischemic ECG changes
- Angina pectoris

Normal Function

Perfusion Abnormality

Regional diastolic dysfunction

Regional systolic dysfunction

Myocardial oxygen demand

Coronary blood flow

Decrease in coronary blood flow
Thank you